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MASTER'S THESIS

Robotic process automation and intelligent automation as a subject of purchasing in public sector - assessment on how synergy benefits could be reached

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ABSTRACT

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Objectives: Manual and routine tasks are still part of knowledge work. This prevents workers from doing more interesting and useful work. The public sector has acquired experience in robotic process automation (RPA) through projects and pilots to reduce the repetitive and time-consuming tasks, yet it seems that RPA still is applied more actively on the private side than the public. Procuring and introducing new technology to the organization is always challenging, not to mention the demands of public procurement. Following the public procurement processes and the laws related can be quite complicated and labour-intensive.

The purpose of this study is to understand RPA and intelligent automation as subject of public procurement and analyse how synergy benefits could be generated for the public sector, especially from centralized procurement point of view.

Methodology: The research was conducted as a qualitative multiple case study research**.** The empirical part explores five cases to understand the subject matter, the challenges in tendering, the knowledge work automation journey, the different procurement methods used and possibilities for joint procurement. The first four cases focus on suppliers and forerunner organizations' point of view. These serve as background and a benchmark for the government's central purchasing unit. Estimating the synergy potential of RPA was conducted by analysing different dimensions: economies of scale, economies of information & learning and economies of process.

Results: Starting the RPA journey and completing the procurement phase took a considerable amount of resources in all forerunner organizations. RPA cannot be compared to basic software procurement - it is more challenging. Potential for synergy benefits could be identified, but it was estimated that the potential is higher in the economies of learning & information and economies of process - low in economies of scale. A central dynamic purchasing system (DPS) on RPA could be set up by the central purchasing unit. However, the total anticipated spend is a key factor to be estimated to ensure that the effort involved returns the expected benefits. To ensure that DPS generates true value to the customers, it requires that the tender competitions under DPS are made easy as possible (support is available and ready-made templates are improved and updated during the period of DPS).

TIIVISTELMÄ

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Tutkimuksen tavoitteet: Manuaaliset ja rutiinitehtävät ovat yhä osa tietotyötä. Tämä estää työntekijöitä tekemästä mielenkiintoisempia ja hyödyllisempiä työtehtäviä. Julkinen sektori on hankkinut kokemuksia ohjelmistorobotiikasta (RPA) hankkeiden ja pilottien avulla toistuvien ja aikaa vievien tehtävien vähentämiseksi. Vaikuttaa siltä, että ohjelmistorobotiikkaa sovelletaan aktiivisemmin yhä yksityisellä puolella kuin julkisella. Uuden teknologian hankinta ja käyttöönotto organisaatiolle on aina haastavaa, puhumattakaan julkisten hankintojen vaatimuksista. Julkiset hankinnat ja niihin liittyvä lainsäädäntö voi olla varsin monimutkaista ja työaikaa sitovaa.

Tämän tutkimuksen tarkoituksena on ymmärtää ohjelmistorobotiikkaa ja älykästä automaatiota julkisten hankintojen kohteena ja analysoida, miten synergiaetuja voitaisiin tuottaa julkiselle sektorille, erityisesti hankintojen keskittämisen näkökulmasta.

Tutkimusmenetelmät: Tutkimus suoritettiin kvalitatiivisena monitapaustutkimuksena. Empiirisessä osassa tutkitaan viittä tapausta, joiden kautta pyrittiin ymmärtää hankinnan kohdetta, kilpailutukseen liittyviä haasteita, tietotyön automatisointiin liittyvää matkaa, käytettyjä hankintamenetelmiä ja mahdollisuuksia yhteishankinnan toteuttamiselle. Neljä ensimmäistä tapausta, jossa tutkitaan toimittajan ja edelläkävijäorganisaatioiden näkökulmia toimivat taustana ja vertailukohtana valtion hankintayksikölle. RPA: n synergiapotentiaalin arvioiminen tehtiin analysoimalla kolmea eri ulottuvuutta; mittakaavaetuja, tieto- ja oppimishyötyjä sekä prosessihyötyjä.

Tulokset ja yhteenveto: RPA-matkan aloittaminen ja hankinnan läpivieminen vei paljon aikaa kaikissa edelläkävijäorganisaatioissa. RPA:ta hankinnan kohteena ei voida verrata perusohjelmistohankintaan - kyseessä on haastavampi hankinnankohde. Mahdollisuuksia synergiaetuihin voitiin tunnistaa, mutta informaatio- ja oppimishyödyissä ja prosessihyödyissä on suurempi potentiaali - mittakaavaedut arvioitiin alhaiseksi. Yhteishankintayksikön olisi mahdollista perustaa dynaamisen hankintajärjestelmän (DPS) RPA:lle. Ennakoidun kulutuksen kokonaismäärä on kuitenkin keskeinen tekijä, joka on arvioitava sen varmistamiseksi, että työ tuottaa odotetut hyödyt. Jotta DPS:n avulla voitaisiin tuottaa todellista lisäarvoa asiakkaille, resursseja olisi käytettävä sen varmistamiseksi, että DPS:n kauden aikaiset tarjouskilpailut ovat asiakkaille mahdollisimman helppoja (tukea on saatavilla ja valmiita malleja parannetaan ja päivitetään).

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1. INTRODUCTION

"It's a total moron" declared the management guru Peter Drucker back in 1967. Drucker was pointing his words to a computer as he was witnessing the first attempts to automate knowledge work (Davenport & Kirby 2015). He was a legitimate man to make this observation (or insult) since he was the one that devised the term ''knowledge work'' as early as 1959. Back then Drucker predicted the rise of 'knowledge work'' referring to an age when people would generate value with their minds rather than with their muscles. He saw that knowledge would be more crucial economic resource than land, physical labor, or financial assets (Drucker 1959).

Fifty years later it is hard to disagree with Drucker's anticipations. Today knowledge work accounts for a considerable proportion of jobs in the developed economies. People collect data and information, processing it to build knowledge and then exploiting it in their daily work processes. Admittedly, work with increasing integration of information creation and consumption has proven to be very crucial factor for the growth of modern economies (Reinhardt et al. 2011).

The knowledge-based economy today is created on workers who are involved in knowledge-intensive tasks in their day-to-day work. According to Reinhardt et al. (2011) these knowledge-intensive tasks are said to resist standardization because of their contingent nature. However, a great part of the knowledge work today still contains repetitive, time-consuming and routine tasks. Lacity and Willcocks (2015) see that disappointingly little amount of knowledge workers time is spend on high-order thinking tasks. They suspect that this is because companies invest in multiple office technologies and knowledge workers must spend time with the quirks and shortcomings of a system. This means that knowledge workers must do troublesome tasks like moving massive amounts of data from one system to another. Likewise, Fersht and Slaby (2012) argues that business units often create their own manual workarounds for the shortcomings of IT-based software with the help of desktop tools such as spreadsheets and unstructured databases. These workarounds are not integrated into the firm's larger IT framework and therefore can be prone to error and vulnerable in terms of security. A recent study by McKinsey Global Institute concurs with these theoretical foundations by pointing out that approximately 17 % of work consists of data collection and 16 % of data processing, which both are tasks usually performed by a human. In the research, it was calculated that

potential for automation of these tasks measured in time were 64 % in data collection and 69 % in data processing. These findings were calculated as an average from all occupations in the US. (Chui et al. 2016).

All in all, this suggests that knowledge work includes manual and routine tasks, that prevent workers of doing more interesting and useful work. The limitations of IT software, lack of communication between technologies and extensive data collection or processing are reasons why knowledge work is not just high-order thinking tasks and problem solving - the knowledge work includes slack.

Since 1967 and the first un-impressive attempts to automate knowledge work witnessed by Peter Drucker, recent automation advances have changed the setting. The rise of new automation technologies and software enable automation of work also in offices, making knowledge work more efficient. Technologies include robotic process automation (RPA) and intelligent automation based on artificial intelligent (AI) or cognitive systems. These technologies have emerged fast, during last couple of years or so and they are creating a lot of hype (Laciety & Willcocks 2016). Automation itself is not causing the excitement, as automation has been around us for a long time to replace human labor, in many areas of life and most of all in the manufacturing industry. However, automation in the back offices, automation of services and automation of knowledge work is more recent subject. As robotics and artificial intelligence are involved, it has caught the attention of the business world.

Noticing the spreading of emerging automation technologies in private sector, should public sector be also interested in this phenomenon? For instance, could automation technologies increase productivity, control costs and reduce the repetitive and time-consuming tasks - in other words cut the slack and save tax payers money? Undoubtedly, the public sector needs its limited resources in more efficient use.

Advances towards knowledge work automation may be already occurring in the public sector as one of the Finnish Governments strategic priorities has been digitalization and some of the key projects under this theme have interface with robotics and intelligent automation. According to Mid-term review on Governments action plan for 2017-2019 (Prime Minister's Office 2017), Government resolutions have been adopted on intelligent automation and robotization. These resolutions or guidelines are being implemented by the ministries and administrative branches. The government has an Artificial Intelligence program, which aims for Finland to be one of the world's leading countries able to apply artificial intelligence faster than its competitors. The core objective of the artificial

intelligence and robotics program is to highlight artificial intelligence and robotics as a success factor for Finnish organizations and companies.

A search to Supplement to the Official Journal of the EU reveals that there have been some robotic process automation contract notices published in Finland (e.g. Palkeet, HUS Logistics, Tax Administration). A report published by Prime Minister's Office (Kääriäinen et al. 2018) concurs the public sector has acquired experience and know-how in software robotics through projects and pilots. However, Kääriäinen et al. remark that RPA still is applied more actively on the private side than the public. It could be anticipated that the number of RPA and even artificial intelligent contracts in public sector are likely to grow if the technology proves itself and the early adopters have success stories to share.

Wide productivity gains could be reached if public organizations employ the new technologies well. However poorly executed automation could mean severe problems. Especially hypes tend to lead to an unhealthy fear of missing out the good stuff and possibly to unwise decision making. One must remember that it is not the technology itself that fixes the fundamental flaws of business - therefore it is not the miracle cure for problems. Kirkwood et al. (2017) note that "You don't automate a broken process" and "there is nothing so useless as doing efficiently that which should not be done at all." Similarly, Bainbridge (1983) has claimed that automation that increases workload is one of the ironies of automation. Careful consideration and planning are therefore needed. Maybe even new kind of perspective to the old processes. The use cases should be carefully thought. For public sector and government, it means also that RPA and intelligent automation technologies are put out to tender and purchased smartly.

The importance of purchasing is increasingly being noted and more attention is placed on purchasing activities in organizations (Karjalainen 2011). In the public sector, the procurement is regulated, which means that contracting authorities and entities are under an obligation to follow tendering procedures and advertise their contracts to ensure real competition. Procedures must be carried out in accordance with national procurement legislation and the procurement directives of the European Union. Following the public procurement procedures and contract law can be quite complicated and labour-intensive for those who are not familiar with the subject.

This study examines how it could be possible to support the public organizations in their automation technology procurements in order that the public sector would have chance to reach productivity gains.

1.1 Research gap and objectives of the study

Topics of RPA and artificial intelligence are increasingly discussed in the media - unfortunately it is sometimes referred to with mixed terms and definitions. The discussion revolves sometimes more around the topic of how technology will make workers redundant as opposed to how automation can augment work. Academic research, peer reviewed journal articles, on the topic of knowledge work automation are still rather limited. Based on the literature review for this master thesis, following two reasons might explain the gap. While there exists extensive literature about automation itself, the topic of knowledge work automation is more recent, emerged during the past few years. Furthermore, the automation technology is not static, but developing all the time. The research gap justifies why it is important to study the subject and find out more information from the field. Especially in the context of public sector as it is still behind the private sector in applying RPA (Kääriäinen et al. 2018).

As described in the introduction of this master's thesis, there has already been some RPA procurements in the public sector, but it is anticipated that there are still many public authorities that could benefit from robotic process automation or intelligent automation technologies. However, the tendering of such technologies might be seen challenging and time-consuming. As RPA and intelligent automation are recent technologies, one challenge can be obtaining the information that is essential for a successful procurement.

The general motivation for this master's thesis was to find out more information of RPA and intelligent automation and understand the subjects from the public procurement perspective. Understanding the subject matter helps to discover the possible challenges and whether the public organizations might benefit from purchasing synergies - joining forces, rather than working independently. The main goal of this research is to analyse if synergy benefits could be generated for the public sector.

Deriving from these observations, this research attempts to answer the following questions:

Main research questions

- *How synergy benefits could be reached in public procurement regarding purchasing of RPA and intelligent automation?*

Sub research questions

- *RPA and intelligent automation technologies as a subject of procurement and how these fit as a subject of centralized purchasing in public sector?*

- *What should be considered when tendering RPA and intelligent automation?*

- *How to support public authorities in the purchasing process (from need recognition to bidding and procurement) of automation technologies?*

1.2. Theoretical framework

The theoretical framework of the thesis is illustrated below in Figure 1. The theoretical framework consists of two main research areas. The study will draw its theoretical background from the research related to automation as well as public procurement.
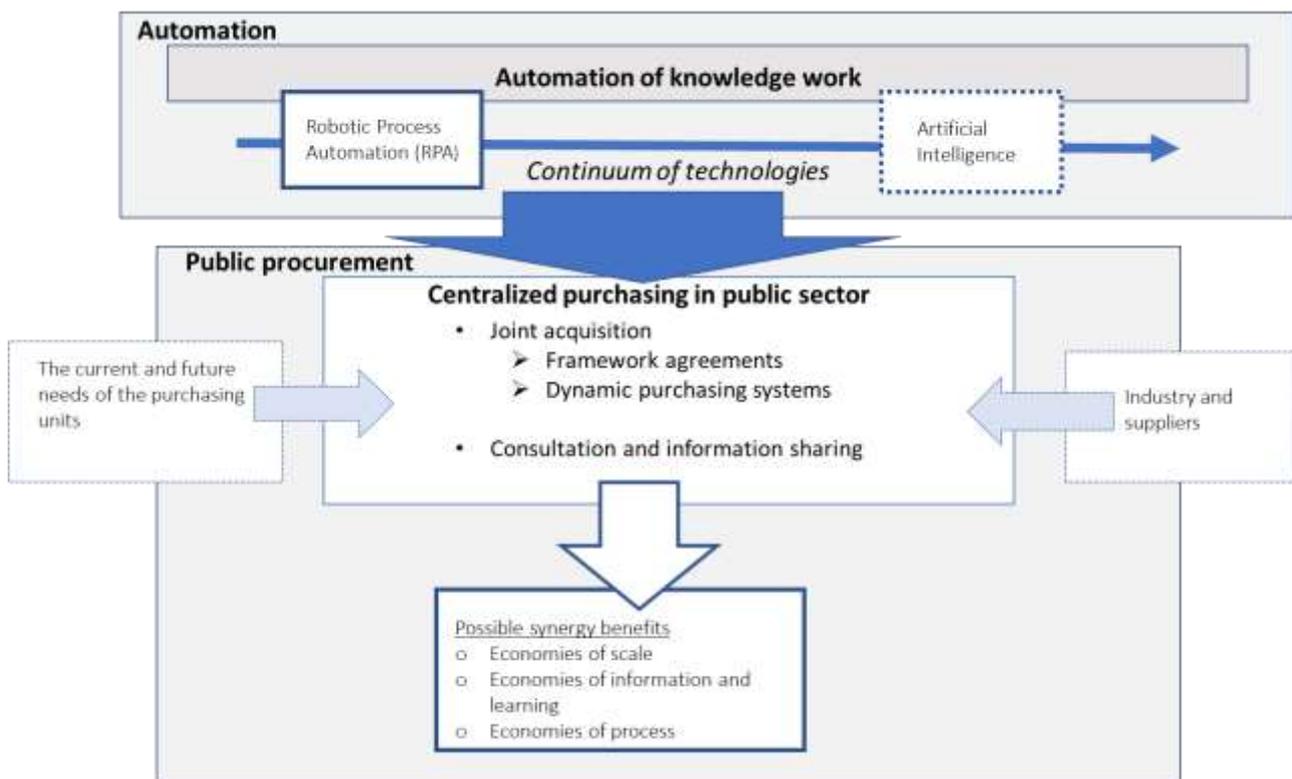

Figure 1. Framework of the study

Lacity & Willcocks (2016a) see that the different technologies of knowledge work automation can be illustrated through a continuum ranged from Robotic Process Automation (RPA) to Artificial Intelligence. In this master's thesis the focus is on RPA as it is where most organizations today begin their back-office automation journeys (Laciety &

Willcocks 2016). However, the intelligent (process) automation is included too as Kääriäinen et al. (2018) noted in their research that even though RPA and artificial intelligent are considered separate and have different definitions, in the future these technologies are integrating. This is already happening in the supplier field according to their research. Artificial intelligence itself is left out from this research as the concept of AI is so broad and loaded with different meanings.

This study examines RPA from the view point of public procurement. That said, a second stream of research supporting this study is public procurement. The interest is especially in synergy benefits that could be generated in the public sector. According to Rozemeijer (2000) purchasing synergy can be created even between two business units, but in this master's thesis the focus is on synergy benefits arising from centralized purchasing. It is possible to determine two main set of activities that are relevant in centralized purchasing in public sector. Firstly, centralized purchasing is typically understood as framework agreements or more recently also as dynamic purchasing systems. These can be described as forms of joint procurement. The dynamic purchasing system is hypothesized to be more feasible for RPA as the dynamic purchasing system has been used for this subject possibly more than other methods. Secondly, centralization in public sector can also refer to consultation and information sharing or other supporting services.

The current and future needs of the different purchasing units are essential when evaluating the potential for centralized procurement from the view point of the centralized purchasing unit. However, a profound needs assessment of the procurement units is left out from the scope of this study. In this research the focus is on the subject matter, how it could fit as a subject of centralized procurement and whether and how synergy benefits could be achievable. Importantly, there is already evidence that public organizations have experimented RPA (e.g. Finnish government shared services centre for finance and HR, Tax administration and HUS logistics).

The information about knowledge work automation industry and suppliers are also important when centralizing procurement. In this study detailed market research is left out from the scope of the research, but the views of few carefully selected suppliers and rea are included.

1.3 Definitions and Key Concepts

The most relevant definitions concerning this study are explained here in this chapter. However, some of the concepts discussed in this thesis do not have agreed or established definitions yet or there can be different interpretation of the scope of the definition.

Automation of knowledge work

In this thesis the term knowledge work automation is used to draw a distinction between automation of physical work and the work that is related to information. The term is seen to refer to all technologies that improve and support knowledge work and make it more efficient. It does not necessarily refer to displacing humans altogether from a certain job position. Instead it implies that machines and technology can assist or augment knowledge workers in their tasks and collaborate with them. In this research the focus is on robotic process automation.

Robotic process automation (RPA)

Robotic process automation refers to a software tools and platforms that can automate rules-based processes with structured data and deterministic outcomes (Lacity & Willcocks 2016b).

Intelligent (process) automation

The term intelligent automation (also intelligent process automation) is used in this thesis of process automation technologies that include some type of cognitive solutions like artificial intelligence, machine learning, analytics, natural language generation. In short intelligent automation is regarded to automation powered by artificial intelligence.

Public procurement

According to European Commission (2017) public procurement refers to purchasing supplies, works and services with public funds by government agencies and public authorities. Public procurement comprises a very large percentage of a government's economy, so it is important to ensure government agencies are implementing the most cost-effective and sensible methods to provide public services. To create a level and non-discriminatory conditions for suppliers across Europe, EU law defines the minimum public procurement rules. These rules guide the way how public authorities make their purchases.

Purchasing centralization

Purchasing centralization can be described as an arrangement in which purchasing is handled by one special unit or department (Joyce 2006). Similar to Karjalainen (2009) purchasing centralization is defined in this thesis as activities up to and including completion of central contract/framework agreement for the whole organization as well as the management of the contract during the agreement period. Purchasing centralization does not refer to a set up where procurement of all categories is centralized, nor does it refer to an arrangement where each step of the purchasing process is handled from one central unit (Karjalainen 2009). Furthermore, setting up a dynamic purchasing system is also regarded as centralized purchasing in this thesis. It is also viewed here that unit handling centralized purchasing can offer support to its subunits in their unique purchases that do not have potential for pooling.

Framework agreements

Framework agreement are negotiated centrally, based on pooled volumes of all units, and the units are expected to order against such agreements (Karjalainen 2009). In other words, these are agreements with preferred suppliers that set out terms and conditions under which specific purchases can be made throughout the term of the agreement. Under the agreement it is possible to order or to purchase through a lighter tendering process products and services. The quality of the products and services is set and specified in advance.

Dynamic Purchasing system (DPS)

Dynamic purchasing system refers to a purchasing mechanism that remains open throughout the period of its validity which means that suppliers can submit qualifications at any point to be admitted inside the system The DPS can be seen to involve of two main stages; the establishment of the system and a competition process under the DPS. The DPS is required to run as a completely electronic process. (James 2016).

1.6 Structure of the work

The structure of the thesis is visualized in figure 2. The introduction part is followed by the theoretical findings from the literature review. This part is two-fold. First part describes knowledge work automation and it summarizes research from the field of automation, business process management, robotic process automation and intelligent automation. The second part concentrates on public procurement, focusing especially on purchasing

centralization and synergy benefits. The purchasing centralization includes the topics of framework agreements and dynamic purchasing system.
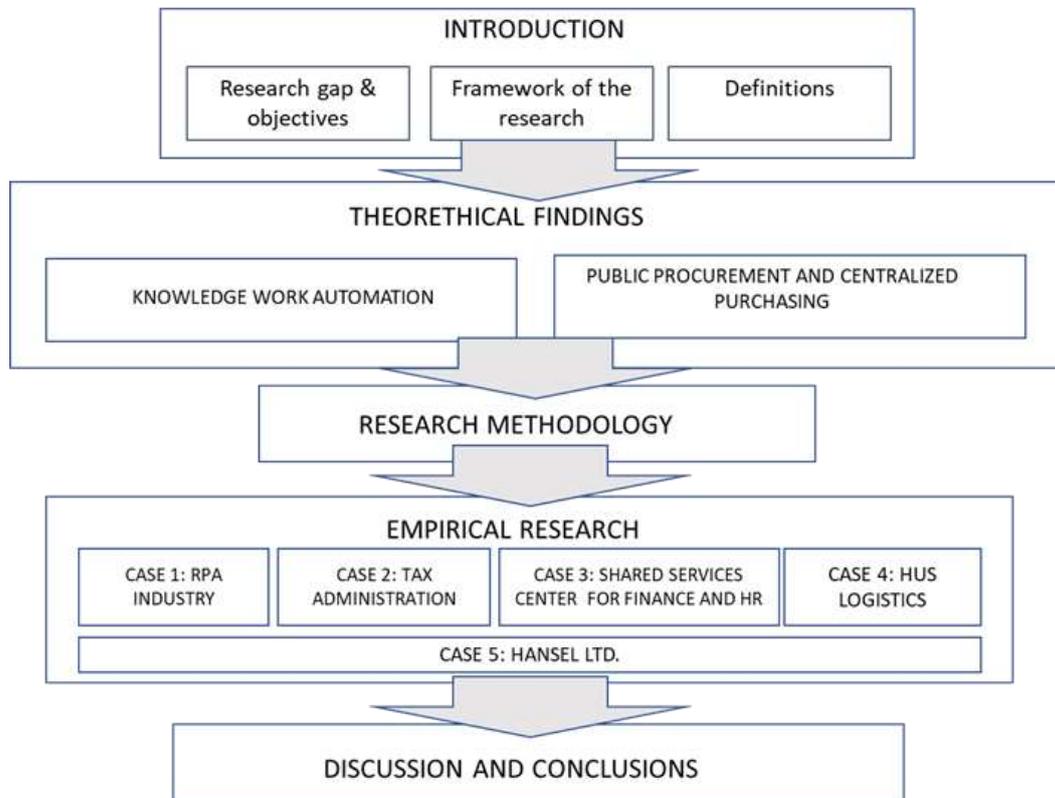
Figure 2. Structure of the thesis

The subsequent part of the thesis describes the methodology and the data collection process, and the limitations of the research are analysed as well. The empirical part of this thesis is conducted via multiple case study. The empirical research explores through five cases the robotic process automation as a subject of public procurement.

Finally, in the last section, the conclusions are drawn and discussed. Findings from the theoretical part are used to support the results. The aim is to identify how synergy benefits could be generated through centralized procurement. Bearing in mind that RPA is a new research subject, there are recommendations and suggestion for future research in the final part of this thesis.

2 KNOWLEDGE WORK AUTOMATION

The theoretical findings start from the concepts of automation and augmentation. After that the business process management is discussed as understanding of processes is important before automating them. Kirkwood et al. (2017) highlight that "*anybody who's interested in RPA should have basic understanding of how to look at a process, how to identify non-value-added activities and eliminate those before they start to implement automation.*" In the end of this chapter RPA and intelligent automation are described.

2.1 Automation vs. augmentation

Parasuraman and Riley (1997) define automation as *"the execution by a machine agent (usually a computer) of a function that was previously carried out by a human*". This definition seems to be accepted in the scientific literature as it has been later referred in other articles afterwards (e.g. Singh et al. 2009; Vagia et al. 2016; Wickens et al. 2013) The popularity of the definition Parasuraman and Riley coined lies probably in its all-embracing nature, which continues to be valid. Moray et al. (2000) describe automation similarly, but they define nature of the operations that can be automated. In their view "*automation is any sensing, detection, information processing, decision-making, or control action that could be performed by humans but is actually performed by machine.*" However, Parasuraman & Riley (1997) note that once the reallocation of a function from human to a computer or other machine is completed and permanent, the function will tend to be seen simply as a machine operation instead of automation. Therefore, what is now considered automation will change after time. In addition to this conversation Wickens et al. (2013) note that in some cases the term automation has also been used to describe tasks that humans are incapable of for example sensing beyond the visible or audible range.

Vagia et al. (2016) see that the word automation, in its original meaning, refers to a system that will execute tasks exactly according to the instructions of the programmer without having any choice or possibility to act in a deviant way. This meaning has been accurate in the past, but can be too narrow for the future, as machine intelligent is developing. In fact, Vagia et. al (2016) found out in their research, that most of the authors of the scientific papers they went through, tend to use the word automation (over the word autonomy) even when referring to a system that is free to make choices.

Automation has made a lasting entry into the world of manual labour. Currently, it is extending to the field of cognitive functions such as decision making, planning and creative

thinking. Davenport and Kirby (2015) separate three eras of automation that are shown in figure 3. The first era took place in the 19th century as machines took the most dirty and dangerous tasks as well as relieved humans of heavy manual work. The second era took place in the 20th century as machines took away some of the dull tasks. The authors refer to automated interfaces and computers that relieved humans of routine service transactions and secretarial chores. The third era known as 21st century can be characterized as the era when machines take away the decisions. The authors refer to intelligent systems such as IBM's Watson. These systems are expected to make better choices than humans, reliably and faster. (Davenport & Kirby 2015)
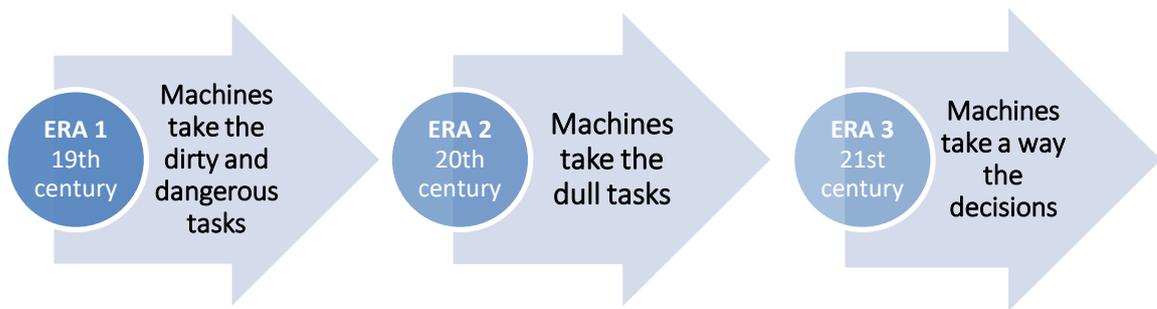
Figure 3. Three eras of automation (Davenport & Kirby 2015)

Even though we have moved to the third era according to Davenport & Kirby, other sources indicate that knowledge work still includes "dull" tasks that are manual and repetitive (Lacity and Willcocks 2015; Chui et al. 2016; Fersht & Slaby 2012). Davenport and Kirby's taxonomy does not consider that the same computers, software and information systems that relieved humans from dull tasks in the second era, are creating new routine or manual work. Similarly, the increasing and continuous data flows that these systems produce are hard and time-consuming for a human to process.

In history automation has not always received a warm welcome and concerns over automation and its negative impacts on employment have lived strong (Autor 2015; Vagia et al. 2016) Yet, the past two centuries of automation and technological progress have not made human labour obsolete and the employment-to-population ratio even rose during the 20th century (Autor 2015). As automation is entering a completely new field - the cognitive functions - it is hardly reassuring to look in the past. The emergence of technologies such as improved computing power, artificial intelligence and robotics raises questions about how automation and employment will interact in the future. Autor (2015) reminds that automation does indeed substitute for labour as it is typically intended to do so, but it also has a purpose of complementing labour. This is something that the media often forgets. Media overstates

the first part and ignore the complementarities between automation and labour such as increase in productivity, raised earnings and increased demand for labour (Autor 2015). Likewise, Vagia et al. (2016) remind that replacing manual work performed by humans increases productivity and in addition leads to improvement in quality, accuracy and precision. The technology is expected to help rather than replace the work of humans.

Wickens et al. (2013) have introduced five general categories of automation that serve different purposes (Figure 4).
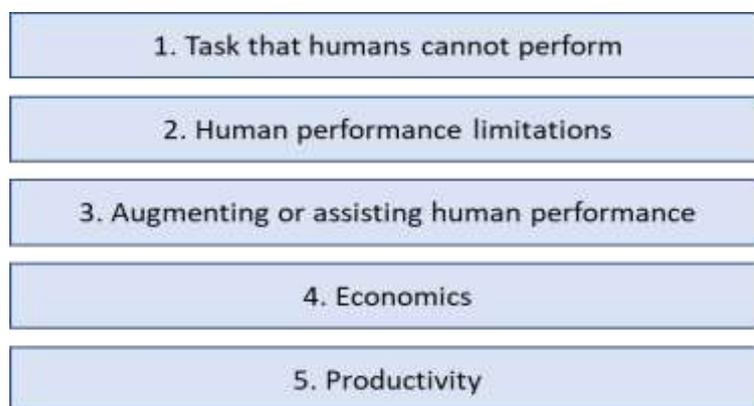
Figure 4. Different purposes of automation (Wickens et al. 2013)

Firstly, automation can perform tasks that are beyond the ability of a human operator. This category holds complex mathematical operations performed by computers (statistical analysis), control guidance in booster rockets, controls in complex nuclear reactions or operation in hazardous restricted spaces. In these conditions, automation can be essential and unavoidable regardless of the costs.

Secondly, automation can perform tasks that humans do poorly, or human operators cannot perform them within a required time frame, or the workload would be too much due to systems complexity and information load. Examples include automation of certain monitoring functions in commercial aircrafts and ship navigation.

Thirdly, automation can augment or assist humans by performing tasks where they have limitations. This category is similar with the previous category. However, automation in this category is intended to aid in marginal tasks or mental operations necessary to succeed in the main task. The automation can help the in the bottlenecks of human performance especially reducing the memory load or help in prediction or anticipation.

The fourth category consists of instances where automation introduced because it is less expensive than paying people to do the equivalent jobs or to be trained for those jobs. This shows as robots replacing humans in manufacturing plants and replacing human in the phone service. the economy achieved by such automation does not necessarily make service "user friendly" to humans that must interact with it.

And finally, the fifth category consist of instances where automation can be introduced in circumstances where there is increased demand for productivity and limited manpower. An example of such situation might be increased number of patients and the number of doctors is limited or there is demands for air travel to increase the number of planes in the sky, but the work force of skilled air traffic controllers is limited.

Davenport and Kirby (2015) have studied cases in which knowledge workers collaborate with machines to do things that neither could do well on their own. They suggest that we should reframe the threat of automation as an opportunity for augmentation. With that Davenport and Kirby mean that automation typically in organization aims for increased cost savings and this starts with a baseline of what people do in their job and then subtract from that. Augmentation, in comparison, means figuring out how the work that is done today could be deepened rather than diminished by a greater use of machines. This type of automation falls naturally to the fourth category "Augmenting or assisting human performance" in the classification of Wickens et al. (2013). Lacity and Willcocks (2016b) found out in their research that automation affected parts of jobs more than entire jobs. They made a remark that the effects on employment meant increases in productivity and reductions in hiring or outsourcing as opposed to layoffs.

Automation is typically seen as a continuum of multiple levels instead of an all-or-none concept (Parasuraman 1997; Wickens 2013). Many studies discuss the level of automation (LoA) in detail; from the lowest level of fully carried by a human without intervention of technology (totally manual) to the highest level of fully carried out by technology without human participation (totally automated) (e.g. Sheridan & Verplank 1978; Riley 1989; Endsley & Kris 1995; Proud et al. 2003; Fereidunian 2007; Wickens 2013). Various authors have presented different taxonomies on the levels of automation, which differ based on the number and type of levels the taxonomy has (Vagia et al. 2016). The levels of automation concept do not imply that humans and automation work as independent agents. The human and machines are inter-dependent.

Vagia et al. (2016) believe that there exist no correct or wrong taxonomies - they are just different from each other. Even the ones that have been created to be used for the same

types of application can vary a lot from each other. Therefore, the best taxonomy and the one that should be used is the one that fits the user's needs best.

Stirling (2017) has introduced an automation level taxonomy for the application of public sector (Table 1). This taxonomy indicates not only the stage how much automation is used and what roles automation can have in public sector but at the same time indicates that the needs for the technology slightly different in each level.

Table 1. Automation levels at the public sector (Stirling 2017)

Level 0	**No automation** Human resources execute a service/task at public sector
Level 1	**Simple augmentation** Support from a system to accomplish service/task, for example data entry, processing, identifying clusters of activity, profiling etc.
Level 2	**Close supervision** System deals with routine tasks, but executes under continuous supervision of humans. Complex tasks are addressed to a human. Human must be ready to intefere if any problems occure.
Level 3	**Semi-autonomous** Computers deal with monitoring and running of routine tasks. Alarms when human input is needed.
level 4	**Automation** A public service runs itself unless there are severe problems where it requires human interpretation and decesion making.
Level 5	**Fully automated system** Does not require human intervention at all.

Many of the taxonomies assume that once the level of automation is identified by the designer, it remains fixed during the operation (Vagia et al. 2015). This approach is referred to as static automation (Parasuraman et al. 1992). But it is possible that the level of automation may change in real time during the operation making it adaptive automation (Moray et al. 2000).

2.2 Business process management vs. RPA

There is a saying that "IT does not matter, business processes do" (Trkman 2010). Before discussing RPA and intelligent automation more deeply, it is important to understand the bigger picture. A field dealing with challenges related to the fit between organization and its strategy, structure, processes, technology and environment is called business process management (hereinafter BPM) (Trkman 2010). It is quite a suitcase term carrying a whole bunch of different meanings inside. It seems to involve everything from methods, techniques, and tools to support, design, improve, manage and analyse business

processes. Dumas et al. (2012) would summarize that BPM is closely related with the disciplines of Total Quality Management, operations management, Lean and Six Sigma - all of these share the aim for improving business processes and could be used together.

Van der Aalst et al. (2016) describe that BPM can be seen to include all from process automation and process analysis to operations management and the organization of work. Lee & Dale (1998) see that BPM could be considered as: "*a customer-focused approach to the systematic management, measurement and improvement of all company processes through cross-functional teamwork and employee empowerment*". What's more, BPM is not about improving the way individual activities are performed, but managing entire chains of events, activities and decisions that add value to the organization and its customers (Lee & Dale et al. 1998). BPM can also be described as continuous and organized approach to analyse, improve, control, and manage processes (Elzinga et al. 1995). Gulledge & Sommer (2002) consider that process management approach involves the following:

- Documenting the process to obtain understanding how work flows through the process
- the assignment of process ownership to establish managerial accountability
- managing the process to optimize some measures of process performance
- improving the process to increase quality or measures of process performance.

Trkman (2010) proposes a framework to identify critical success factors of BPM. Contingency, dynamic capabilities and task-technology are the three theories that form the basis to identify and study success factors. The case study of Trkman (2010) identified that critical success factors related to contingency theory are *strategic alignment, level of IT investment and performance measurement, level of employee's specialization*. Critical success factors related to the theory of dynamic capabilities are *organizational changes, appointment of process owners, implementation of proposed changes (quick-win strategy) and use of a continuous improvement system*. Finally, the task-technology fit included *standardization of processes, informatization, process automation, training and empowerment of employees*. (Trkman 2010) Derived from this process automation seems to be one critical success factor in a much broader scope. This suggests that automating processes with any tool should be fitted in the bigger picture of managing processes.

RPA literature makes a clear distinction between traditional BPM tools and programs and RPA (Fersht & Slaby 2012; Lacity et al. 2015). Yet, BPM is not a piece of software but a broader discipline. Behrens (2015; also Barnett 2015) see that RPA and BPM do not conflict with each other, but have the same goal with different implementation strategies. As transforming business structures is not always feasible and may take a lot of resources, RPA could be used to continue operations while investigating a more solid fix (Behrens 2015).

Although, the importance of technology is crucial in supporting and developing business processes, it is not always necessary or the absolute value above all. IT itself does not bring about competitive advantage (Trkman 2010). Lacity and Willcocks (2016b) acknowledge in their research that "many innovative technologies overpromise and underdeliver". The expected benefits make people blind and it is easy to forget the features that are needed to reap the benefits. The importance of evaluation, planning, implementation, risks analysis etc. should also be understood so that the technology would not fail the expectations. Tornbohm and Dunie (2017) from Gartner have noted that challenges arise also from shifting of "manual process debt" to "technical debt". This refers to shortcomings in process which then evolve as technological debt as the process is automated.

2.4 Robotic process automation (RPA)

Robotic process automation (RPA) is described mainly as a technology - tools and platforms. However, this is not the whole truth in organizations that acquire RPA. The research conducted by Kämäräinen (2018) found out the RPA was described also as a change program which must begin before the actual implementation of RPA in a company. The technology part is the platform and technical execution.

There are some differences between other methods of automation and robotic process automation. According to Bygstad (2017) the differences can be compressed to the term "lightness". Lightweight IT is well suited for the tasks that heavyweight IT has often failed to support which are the simple and immediate needs of a user. Lightweight IT, such as RPA, typically supports process with more simple applications and cheaper technology. (Bygstad 2017) Similarly Fersht & Slaby (2012) comments that the RPA technology appears best suited for processes in which the requirement for automation is too tactical or short-lived to justify a development using heavyweight IT.

More distinctively, RPA is the application of technology that allows to configure computer software or a 'robot' to use existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems (IRPAI 2018). According to Tornbohm and Dunie (2017) *"RPA tools perform "if, then, else" statements on structured data, typically using a combination of user interface (UI) interactions, or by connecting to APIs to drive client servers, mainframes or HTML code."* That is, an RPA tool operates by mapping a process in the RPA tool language for the software "robot" to follow. Furthermore, Lacity and Willcocks (2016b) describe robotic process automation as *"software tools and platforms that can perform rules-based processes that involve structured data and deterministic outcomes"*. The term deterministic refers to processes that have only one correct outcome or in other words, their outcome is pre-determined. Karamouzis (2016) concurs with the above and adds to the list that RPA can be applied when task profile is routine and predictable and in the same time the data profile must be structured, stable and low velocity. These descriptions hint that the tasks or processes appropriate for RPA are repetitive and tedious for humans.

Fersht & Slaby (2012) has put together a list of the key characteristics that mark a business process as a promising candidate for RPA. They see that a process does not need to meet all the requirements to be suitable for robotic automation but are just markers that the process serve as a potential compelling business case. These key characteristics are: a) location in stable environment, b) need to access multiple systems, c) easy decomposition into unambiguous rules, d) limited need for human intervention, e) limited need for exception handling, f) clear understanding of the current manual costs, (g) high transaction volumes (not necessarily).

Typical sourcing options for RPA according to Lowes et al. (2017) are either direct (RPA licenses are directly bought from the vendor), direct with support (RPA licences directly from vendor and a service partner for configuration and support) or outsource (robot-as-a-service arrangement). Tornbohm and Dunie (2017) evaluate other matters that organization should analyse to select the right software platform. Firstly, there are differences in generic RPA tools for attended solutions operating on a person's workstation versus unattended tools deploying on virtual machines. A buyer should understand how the tool will be primarily used in the organization. Secondly, organization should consider the level of coding knowledge and the amount of IT programming and compiling needed to complete working instructions for the robot. Even if a tool claims to be easy for business people to use without profound IT skills, organization still needs to be clear about governance, best practices in scripting, and where and how IT is involved. Third aspect would be to consider the generic

RPA tools compared to process-specific automation tools. However, most RPA tools have no pre-programmed, process-specific knowledge of vertical and horizontal processes. Fourth aspect matter that should be analysed is whether organization needs limited artificial intelligence or machine learning capabilities on the side or no. RPA tools can work with other types of tools with different capabilities. However, an RPA tool can only process structured data, performing rule-based tasks. (Tornbohm & Dunie 2017)

One more discussion topic seems to be the pricing models. The license models are very diverse across the vendor landscape which makes it challenging to compare them (Tornbohm & Dunie 2017; also Lowes et al. 2017). The alternatives include license based, value based and service-based pricing (Lowes et al. 2017). In the license-based pricing model you typically pay per software license for each installed robot, management server and developing tools. Making meaningful comparison between vendors is difficult as one definition and capacity of a "robot" can vary between vendors. The license can be annual or continuous and the solution can be delivered as SaaS or on-premises. In value-based model the price is tied to full-time equivalent savings or to each completed transaction. This model can be restrictive from the perspective of scaling across the organization as contracts need to be re-evaluated. Last alternative is service-based (consumption-based) pricing model, which means that you pay for what you use or for the renting of robots (delivered via SaaS). In other words, you pay a regular subscription fee for the service. (Tornbohm & Dunie 2017; Lowes et al. 2017)

2.5 Intelligent Automation

Intelligent automation (also sometimes intelligent process automation) is a term that is referred in consultancy white papers, articles and webinars (e.g. McKinsey 2017; Genpact 2018; Digital Workforce 2018) and market research (e.g Gartner 2016 & 2017). The market for intelligent automation is still nascent compared to RPA (Lowes et al. 2017).

Genpact (2018) describes intelligent automation as next step in the automation journey after RPA. According to Digital Workforce (Krumrey 2018) intelligent (process) automation integrates RPA, cognitive solutions like artificial intelligence and machine learning, analytics, workflows and business process management. In their view this enables large business transformation as RPA by itself can automate only a fraction of a business process. Berruti et al. (2017) see that full intelligent process automation comprises of five key technologies; RPA, machine learning/advanced analytics; natural-language generation

and cognitive agents. By contrast, Lowes et al. (2017) considers that RPA tools are separate from intelligent automation tools.

RPA mimics activities carried out by humans, but in the case of intelligent process automation the system learns to do the tasks even better over time. So traditional rule-based automation is augmented with decision-making capabilities. (Berruti et al. 2017) Similarly Lowes et al. (2017) see that intelligent automation can drive value by improving non-routine tasks requiring judgement. According to Tornbohm and Dunie (2017) many RPA providers have added additional tools to work with their RPA tools such as machine learning and optical character recognition.

Lacity & Willcocks (2016a) demonstrate a continuum of automation technologies, which start from the robotic process automation and proceed towards artificial intelligence (AI). However, it is hard job to determine what is exactly considered artificial intelligence as there is no officially agreed definition. Intelligent automation can probably be seen in somewhere in the middle of this continuum.

3 PUBLIC PROCUREMENT & PURCHASING CENTRALIZATION

Procurement has a significant role in organizations, and it has a profound influence on the performance - both in private and public sector. Fundamentally, public and private procurement are similar as goods and services must be acquired and preferably with the best deal. However, public procurement is more complex than private sector procurement mainly because of the regulation involved. Furthermore, there are other additional demands for public procurement that are absent in private sector. Telgen et al. (2007) grouped those demands that exist for public procurement (Table 2). These demands explain the characteristics of public procurement.

Table 2. The different demands of public procurement (Telgen et al. 2007)

External demands	Transparency Integrity Accountability Exemplary behaviour (ethical standards, efficiency, effectiveness)
Internal demands	Serving multiple goals at the same time (internal goals of the organization and the goals of the general public) Political goals Interests of multiple stakeholders
Demands originating from the context	Budget driven Budgets are open Multiple departments and layers of government that operate in mutually dependent budget situations Cultural setting (risk adversity and slow decision-making processes)
Demands on the process	Strict limits imposed by legal rules and organizational procedures Engaging in long-term relationships with suppliers is difficult Cooperating with other public entities
Multiple roles for the public entity	Public entities are usually large buyers (high volumes) Reciprocity (purchasing from suppliers that are citizens/taxpayers and use the services) Public sector is both a player and decision maker on the rules and regulations of the game

The overall definition by European Commission (2017) describes public procurement as purchasing supplies, works and services with public funds by government agencies and public authorities. To create a level and non-discriminatory conditions for suppliers across Europe, EU law defines the minimum public procurement rules. These rules guide the way how public authorities make their purchases meaning demands for the process of tendering. At the same time the laws ensure that external demands are met (transparency, integrity, accountability and exemplary behaviour).

Public procurement comprises a significant percentage of European countries' economy, so it is important to ensure government agencies are implementing the most cost-effective and sensible methods to acquire all the needed goods and services. To ensure that this happens a certain level of transparency, integrity and accountability is demanded (Telgen et al. 2007) In addition, procurement is funded by public funds which suggests that governments should aim at obtaining value for this money, including the quality dimension in the concept of value. Adding to these objectives, public procurement is seen as a tool to promote and encourage different strategic and societal goals such as: participation of small and medium sized enterprises, considering environmental and social aspects and promoting innovation. (HE 108/2016 vp). This concurs with what Telgen et al. (2007) have noted about external and internal demands. The numerous demands and goals add the level of complexity as the list of things that need attention is long. The goals set out (internal and external) might even be partly conflicting. For example, considering environmental requirements in detail might increase the price tag of the procurement. This really highlights the importance of carefully considering which of the goals are the most important ones. Some goals/demands must be met each time and others are possibly ones that can be prioritized.

3.1 Purchasing process

Purchasing process - whether in public or private sector - is seen as a business process that needs to have structure and discipline. In other words, a process a set of activities that have beginning and an end, take place in specific sequence, and have inputs and outputs (Leenders et al., 2006). There is consensus among researchers who have studied processes and quality, that a sequence of efficient and flawless activities is required in order to produce a high-quality output (Hoque 2003). Moreover, Leenders et al. (2006) see that the purchasing process is basically a communications process as the heart of the process is all about determining what needs are to be communicated, to whom, and in what format

and timeframe. Some general requirements can be placed on purchasing process. According to Karimaa (2001) the item purchased should be necessary and appropriate. The process should be efficient so that it uses minimal amount of resources from the organization. What's more the process should take place in the given time frame.

The Figure 5 presents a typical purchasing process that starts from need recognition and ends to contract and relationship management that continues throughout the contract period. Naturally the purchasing process in public procurement is slightly different as there are legal requirements to the different process phases. The contents of a phase are more fixed and regulated and official terms are somewhat different. Still same process steps are executed also in the public sector. (Karjalainen 2009).

| Recognition of needs |
| Description of needs |
| Identification and analysis of possible sources of supply |
| Supplier selection and determination of terms |
| Negotiations and contracting |
| Preparation and palcement of purchase order |
| Follow-up and/or expediting the order |
| Receipt and inspection of goods |
| Invoice clearing and payment |
| Contarct and relationship management |

Centralized process phase
Decentralized process phase

Figure 5. Purchasing process phases most suited for centralization (Karjalainen 2009; also Leenders et al. 2006)

The figure 5 also displays the divisions Karjalainen (2009) uses in her research between the tasks that are most suitable for central purchasing unit (centralized process phases) and the tasks of other organizational units (decentralized process phases). Operative tasks are considered decentralized activities that are delegated to subunits even though purchasing model is centralized (Karjalainen 2009).

The purchasing needs arise in all organizational units, but the rational in centralization is that only those needs, which have the potential for pooling throughout the organization, are selected for the centralized approach (Karjalainen 2009). Turning those needs to product

and service specification and communicating them to the potential suppliers located through a supplier search are the first crucial steps. (Karjalainen 2009; also Leenders 2006)

Often the attention in public procurement is drawn to the competitive tendering or contract award procedure although most important decisions are made already in the preparation stage (Pekkala & Pohjonen 2007). This might be because the process demands are complex, so the attention is draw to them. Likewise, the time frames are set in legislation which mean that procurement processes are longer than in private sector. However, groundwork should not be taken lightly even in time pressure. Also, from the juridical perception the preparation stage is especially important as the most important choices related to the purchasing are made in the preparation stage (Holma & Sammalmaa 2018).

Before the tendering procedure is started the contracting authority should carefully analyse and examine the aims of the procurement (Pekkala & Pohjonen 2007). Not having a mission and clearly defined objectives does not lead to achieving value for money. Leenders et al. (2006) highlight that the purchasing process is closely tied to almost all other business processes in in an organization, therefore creating a need for cross-functional cooperation. This needs to be taken in consideration in the beginning of the process.

3.2 Synergy benefits of centralization

There appears consensus among academics that purchasing centralization provides several benefits, especially in terms of lower prices and economies of processes (Karjalainen 2011). Benefits of centralized purchasing are often referred in the literature as synergy benefits (Karjalainen 2011; Faes et al. 2000; Rozemeijer 2000; Smart & Dudas 2007). Rozemeijer (2000) defines synergy benefits in purchasing as "*the value that is added when two or more business units (or purchasing departments) join their forces (e.g. combined buying) and/or share resources, information, and / or knowledge"*. In other words, the aim is in producing a return on resources that is greater than the sum of individual parts (Karjalainen 2011). Faes et al. (2000) add that synergy is intended to lead to a competitive advantage as two or more business units share knowhow or resources, coordinate strategies or pool negotiation power. On the other hand, Keskinen (2017) reminds that even though the term synergy is seen as positive and favourable in its basic character and spirit (win-win situation), results are not always positive. There is a possibility for rising costs i.e. transactional costs or a decline in service quality when consolidation is prepared poorly.

Rozemeijer (2000) (also Arnold 1999; Goold & Cambell 2000) states that most business synergies take one of six forms: pooled negotiation power, sharing intangible resources, sharing tangible resources, vertical integration, coordinated strategies and combined business creation. Similar synergy benefits are described by others in relation to purchasing. Following the perspective offered by Trautmann et al. (2009) (also Karjalainen 2011; Faes et al. 2000) the purchasing synergy benefits can be divided in three main categories that are presented in table 3. For each of the three categories there are dimensions that influence the particular synergy potential (Trautmann et al. 2009). These dimensions are also listed in the table 3.

Table 3. Synergy benefits and factors influencing the synergy potential (Trautmann et al. 2009)

1. Economies of Scale
- Degree of volume aggregation
- Relevant supply market

2. Economies of Information and Learning
- Purchase difficulty
- Supply Risk

3. Economies of Process
- Transaction volume
- Process complexity

Although a purchasing category might not show high potential for realizing economies of scale or information and learning a high level of economies of process can still be decisive reason for centralization (Trautman et al. 2009). Trautman et al. (2009) noted in their research that the literature has typically focused more on economies of scale, neglecting that there is more to purchasing synergies than bundling. Adopting only one-sided focus means that the full advantages of centralized purchasing are not seized. Karjalainen (2011) criticizes that only minor attention is given on previous researches on the fact how to quantify any of these synergy benefits. Karjalainen (2011) has addressed this deficiency in her research, which investigated effects of centralization on tendering process costs (economies of process) and purchasing prices (economies of scale).

3.1.1 Economies of scale

The first category, *economies of scale,* refer above all to attaining lower unit costs. This can be achieved increasing market power through volume and standardization of categories (Trautmann et al. 2009). Possibility to bundle common requirements and create higher volumes enable the purchasing unit to take advantage of quantity discounts (Joyce 2006). Tella & Virolainen (2005) also mention that increasing the volumes increases negotiation power in supply market, which leads not only to better purchasing prices but also to better contract terms.

According to Trautmann et al. (2009) the first dimension under this category is *degree of volume aggregation.* What needs to be considered is the extent to which common requirements and harmonized specifications are available across the different subunits (Trautmann et al. 2009). It can be said that combining items with similar specification builds the basis for centralization. This might involve negotiation with customers over standards and service expectations (Smart & Dudas 2007). Harmonizing specification is certainly easier with some items than others. According to Karjalainen (2011) the routine and leverage items from Kraljic's (1983) purchasing portfolio are most suitable for centralizations. This is because the needs are more similar for these products. Faes et al. (2000) propose similarly that the centralized purchasing approach is more suitable for items with low site specificity and low specificity linked to assets or human resources (such as non-production goods). Another two questions that need to be analysed in this context is the extent to which specifications remain constant and the extent to which demand is repeating (Trautmann et al. 2009).

The second dimension under economies of scale is "the relevant supply market" meaning primarily the geographical scope. The most important factor that needs to be analysed is the "supplier delivery capacity" referring to suppliers' size, logistics capability and capacity to handle big volumes. (Trautmann et al. 2009) Large suppliers can deliver cost-effectively to different locations, have more capacity and therefore enable the realization on economies of scale.

3.1.2 Economies of information and learning

The second category, *economies of information and learning,* relate to benefits resulting from sharing information and knowledge across subunits. According to Trautmann et al.

(2009) the foundation here is information processing theory which suggest that when decision-makers face uncertainty they seek to reduce it through gathering additional information for example from other organizations. Rozemeijer (2000) sees that different units can improve their results by pooling insights from a process by formulating purchasing strategies, applying purchasing tools and techniques or developing purchasing skills and competencies. Faes et al. (2000) complement this view with their own list regarding this category; sharing all available knowledge on suppliers, new technologies, markets, applications and negotiation strategies. The efficient use of available purchasing skill is an argument in favour of centralization (Arnold 1999). Joyce (2006) explains that centralization enables that certain categories of items are assigned to specialist who can concentrate their efforts on relatively few items, which they are responsible for. Concentrating purchasing skills increases efficiency and prevents unnecessary mistakes as the sate-of-the-art purchasing knowledge is available.

The fist dimension under this category is purchasing difficulty, which describes the complexity and uncertainty related to the category being purchased (Trautmann et al. 2009). McQuiston (1989) describes that purchasing process is expected to vary according to how much experience the organization has previously had (newness of the problem), how much information is needed to make a decision (information requirements), and the extent to which alternative product offerings were considered (consideration of new alternatives).

Another way to analyse the nature of the purchasing process is to examine the novelty, complexity and importance of the purchase (McQuiston 1989). If the purchase scores high on these aspects, more information is needed to complete the purchase process. The novelty of purchase refers to situation where category is new to the organization or entirely new in markets (Trautmann et al. 2009; McQuiston 1989). McQuiston (1989) found out that complexity is typically broken down to complexity of the purchase situation and complexity of the product. In comparison, Trautmann et al. (2009) see that complexity can be broken down to i) specification complexity ii) technical complexity and iii) commercial complexity. Specification complexity refers to extent which product needs to be customized. Technical complexity refers to capacity of suppliers and contract structures that need to be addressed in order to ensure that the final product is compatible with needs of internal customer of centralized purchasing. Commercial complexity is considered high if there are complicated commercial arrangements (Trautmann et al. 2009). The importance of the purchase can be described as perceived impact of the purchase on organizational profitability and productivity (McQuiston 1989)

Uncertainty and complexity can be linked to external factors of the organizations as well, rising from the supply environment. Tautmann et al (2009) refer to this second dimension under the category of information and learning synergies as "supply risk". Companies face high level of uncertainty from the supply environment in situations where the number of suppliers is low, substitution possibilities do not exist, prices are not stable and supply market is lacking transparency (Trautmann et al. 2009). In these cases, the need to gather more detailed information from the supply market is high.

Similarly, high levels of complexity require careful analysis, additional information and further effort. Organizations gathering the most applicable information are best able to cope with uncertainty and therefore the influence tends to gravitate to those organizations (McQuiston 1989) In situations where category purchase complexity and supply risk are considered both high, purchasing unit can benefit from exchanging category and market information (Trautmann et al. 2009)

3.1.3 Economies of process

Thirdly, *economies of process* relate to benefits arising from a common way of working and exchanging best-practice to purchasing procedures. This can lead to one line of conduct towards suppliers, benchmarking procedures and results, as well as joint training and development. Reduced transactions can be another source for cost savings. (Faes et al. 2000; Trautmann et al. 2009; Karjalainen 2011).

First dimension under this category is transaction volume. The factor to be analysed here is the frequency of purchasing transactions for a specific category (Trautmann et al. 2009). In the context of public procurement, it could also mean the frequency of competitive tendering procedures held by organizations of the same subject matter. Second dimension determining the potential of economies of process is the process complexity. This refers to the coordination costs along the purchasing process. Process complexity is the level of information that must be processed along the purchase circumstances. (Trautmann et al. 2009)

Tella & Virolainen (2005) see that individual purchasing units can lower the amount of transactions related to purchasing activities by participating in purchasing consortium. According to Karjalainen (2011) economies of process in the context of public procurement

centralization can mean reduction of duplicated efforts in several phases of the purchasing process as well as standardized operating procedure towards the suppliers. Essig (2000) speaks of administrative work; less administration work, decrease in administration duplication and reduction of expenses create synergy benefits.

The two dimensions (transaction volume and process complexity) enable to determine situations in which establishment of best-practice processes is beneficial. Furthermore, implementation of electronic procurement can be regarded as solution to reduce transaction costs when frequency is high. (Trautmann et al. 2009). All in all, the establishment of an efficient purchasing process across sites holds benefits especially in the categories characterized by high transaction volumes and process complexity.

3.2 Purchasing centralization in public sector

Capturing synergies is a way of getting extra performance or creating extra value from an existing situation that can be understood also as doing more with less (Rozemeijer 2000). This aspect is very significant in the public sector. According to Dimitri et al. (2006) centralization appears as a clear trend in public procurement as well. The Act on Public Procurement and Concessions Contracts (1397/2016) state contracting entities can reduce the administrative functions involved in procurement by using framework agreements, practicing joint acquisition as well as benefiting from other opportunities for cooperation in competitive tendering. Karjalainen (2011) suggests that avoiding repeating the burdensome purchasing process is most likely the main reason driving centralization in public procurement, in addition to expected volume discounts from pooled purchases.

Purchasing centralization in the context of public procurement is typically understood as the use of centralized framework agreements. Karjalainen (2011) defines it as "*centralization of activities up to and including the completion of the central contract/framework agreement for the whole organization to use as well as the management of that contract"*. Similarly, Pekkala et al. (2017) state that it is usual that central procurement unit is responsible of setting up of framework agreements or dynamic purchasing system meaning that it chooses the supplies in the framework or system. After this the purchasing units are responsible of the purchases or "mini-competitions" inside the framework agreement or purchasing system. This type of purchasing approach attempts to capture the best aspects of both centralization and decentralization (Munson & Hu, 2010). Karjalainen et. al (2011) state that when centralized agreements are in place, categories that are not suitable for

standardization and/or not purchased by other units are managed with a decentralized operating model where the purchasing process is conducted by individual units.

According to the Act on Public Procurement and Concessions Contracts (2016) the centralized procurement unit can carry out joint procurement as well as supporting activities. In practice the central purchasing units usually offer services related to centralization of purchases such as advice, consulting or building electronic tendering systems (Pekkala et al. 2017).

3.3 Framework agreements

Private and public organizations alike have established framework agreements with selected suppliers to benefit from purchasing synergies (Karjalainen 2009). Framework agreements can be used to procure products, works or service. According to the Act on Public Procurement and Concessions Contracts (2016) *"a framework agreement shall denote an agreement between one or more contracting entities and one or more suppliers, the purpose of which is to establish the prices and planned quantities, and the other terms and conditions of contracts to be awarded during a given period*''. In other words, framework agreements are arrangements where contracting authority and economic operator set the terms on which purchases may or will be made over a period of time (Arrowsmith 2014). Pekkala et al. (2017) explains further that framework agreement is not a competitive tendering method concerning single procurement, but rather a pre-selected supplier register on the subject matter. The pre-selected suppliers have passed the requirements of the purchasing unit and are considered the highest quality and capable to deliver. The quality of the products and services is set and specified in advance.

Arrowsmith (2014) lays out how the process proceeds. First the contracting authority makes the initial call for tenders against the terms and conditions it has proposed. After this the contracting authority chooses one or more supplier to be placed on the framework on the grounds of their offers. During the contract period, the contracting authority places periodic orders or call-offs with chosen framework supplier(s) as particular requirements arise. This suggests that framework agreements are convenient when contracting authorities do not know the exact nature and timing of the requirements in advance. The rationale for most frameworks is to allow the parties to establish terms in advance for later commerce. The benefit of such agreements is that the they save time, resources and delay that would be involved in conducting many separate contract award procedures (Arrowsmith 2014). Pekkala et al. (2017) describe that the nature of frame work agreements is loose as it is an

initial agreement stating the founding requirements for the supplier and offer. All requirements of the procurement are not completely agreed.

Frameworks can be settled with a single supplier or contracting authorities can enter into a framework with more than one supplier offering the same goods or services. Both types can take number of different forms. (Arrowsmith 2014; Pekkala et al. 2017). If a contracting authority has established a framework agreement with a single supplier, then procurements based on the framework agreement are awarded in according with the terms and conditions set in the framework agreement. The contracting authority may ask the supplier to clarify or supplement its tender in writing where necessary. (The Act on Public Procurement and Concessions Contracts 2016) Pekkala et al. (2017) see that the single-supplier type is simple and easy as the orders can be made straight from the chosen supplier. They see that the down side can be whether the level of price and quality stays competitive. Moreover, there might be shortage of capacity or the selection of products and services might be limited.

The multiple-supplier frameworks are somewhat more laborious. The Act on Public Procurement and Concessions Contracts (2016) state that if a contracting authority has concluded a framework agreement with multiple suppliers and all of the terms and conditions of the framework agreement have not been established, then procurements based on the framework agreement need to be made by competitive tendering between the suppliers selected for the framework agreement. This needs to be done in accordance with the criteria for determining the most economically advantageous tender that was set out when establishing the framework agreement.

Arrowsmith (2014) gives number of reasons from a practical perspective to choose multi-provider rather than single-provider arrangement. Firstly, it might not be known which provider can offer the most advantageous terms for a specific requirement until it rises. This can apply if the market is such that suppliers may wish to adjust their offer terms. Arrowsmith (2014) gives information technology products as one example as the technology constantly changes. In some product categories the price fluctuates regularly according to supply and demand. Likewise, which supplier is the most advantageous may not be known until the nature of the order is known. The nature of a specific project may determine what is most advantageous. Second reason for choosing multi-supplier frameworks is related to centralized purchasing. The benefits of centralization are reached for either within an organization or by using an external purchasing body, but at the same time freedom of choice is given to the end users. The end users have their own professional judgement of

what their unit needs. Multi-supplier frameworks also enhance security of supply. In addition, the participation of SME's can be achieved more effectively compared to single-supplier frameworks.

the Act on Public Procurement and Concessions Contracts (2016) state that a framework agreement may not be set out for longer than four years. After this period a new framework agreement needs to be established. During the period of the framework agreement, no fundamental modifications can be made to the terms and conditions of the framework agreement.

All synergy benefits (economies of scale, economies of information and learning, economies of process) are possible to be attained using framework agreements depending of the category (Karjalainen 2011). Having said that, Arrowsmith (2014) sees that securing the potential benefit of frameworks in a manner that outweighs their cost is challenging. According to Karjalainen (2011), the ability to standardize is a prerequisite for centralized contracts. Certain purchase categories are more suitable for centralization than others, for example routine and leverage items from Kraljic's purchasing portfolio seem most suitable for centralized framework agreements (Karjalainen 2011). Faes et al. (2000) see that the most important is the identification of the right cases in which to do centralization and how the implementation within the company should be executed.

3.4 Dynamic Purchasing systems (DPS)

Dynamic purchasing system refers to purchasing procedure used by contracting authority that is entirely electronic (Eskola et al. 2017). It is a purchasing procedure that resembles frame work agreement, the main difference being that new supplier can join in during the existence of the system (Pekkala et al. 2017) The dynamic purchasing systems were introduced into The Public-Sector Directive 2004, but since its introduction the use has been quite low in the first years. However, the updated EU procurement directives have seen some changes concerning the use of the DPS, which have simplified the process. (Government proposal 108/2016; James 2016). Government proposal 108/2016 vp declares that the dynamic purchasing system (including electronic auction) has given purchasing authority the possibility to speed up and increase the effectiveness of processing the tenders in the purchasing process. According to James (2016) it does not seem sensible to establish a DPS for similar goods, services and works many times across a procurement system. With this James means that implementation of a DPS at a central purchasing unit level would seem the most suitable solution to minimise duplication of resources and promote SME engagement across the public sector

Directive on public procurement (2014/24/EU) states that the system may be used for "commonly used purchases the characteristics of which, as generally available on the market, meet their requirements'. James (2016) points out in his dissertation that commonly used purchases are not defined in the regulation and therefore the matter is left for contracting authorities to decide. However, the term used in few different sources is "off-the-self". Arrowsmith (2014) interprets quite strictly that system may only be used to purchases that meet the requirements of the procuring entity without adaptation for the entity's use. This raises some uncertainties.

The government of Scotland (2017) has given guidance to help decide if a DPS is a suitable option (Table 4). In simple terms they consider that DPS arrangements are best suited or targeted in areas where certain elements come together: a large volume of suppliers combined with a large volume of transactions. However, there exists no single metric that would explain what is considered as large volume. Adding to these, the number of many different procurement authorities and the difficulty to achieve economies of scale where also mentioned as factors speaking in favour of DPS. Contradicting slightly with the viewpoint of Arrowsmith (2014), the difficulty to bulk buy was seen one aspect that speaks in favour of the DPS.

Table 4. Checklist for considering the use of Dynamic Purchasing System (adapting Government of Scotland 2017)

	KEY QUESTIONS	ANSWER	COMMENTS
1	Is the marketplace/sector dominated by a large number of independent suppliers?	YES/NO	If no, consider alternative options.
2	Are there regular new entrants/suppliers exiting the market?	YES/NO	Where it is probable that new suppliers will be entering the market or there is the desire to stimulate the market to attract new suppliers, it may be advantageous to use a DPS as a delivery option.
3	Is the market suited to a local custom-made offering/local SMEs?	YES/NO	Typically the more local the provision, potentially the better the match for a DPS.
4	Is there little or no opportunity or very limited opportunity to otherwise shape or stimulate the marketplace?	YES/NO	In terms of shaping the market/sector, is it possible to do things differently? E.g. to set up a prime supplier model or alternative call off models?
5	Is overall annual spend significant enough to warrant setting up specific arrangements compared for the spend?	YES/NO	The total anticipated spend is also a key factor in order to ensure that the effort involved returns the expected benefits from a DPS arrangement. Consideration should also be given to collaboration as an option to raise the spend levels.
6	Are there large volume of transactions?	YES/NO	Lots of transactions or ordering can make a DPS an appealing delivery option but consideration must also be given to how to make the process more efficient.
7	Are there lots of low average unit price per transaction orders being raised?	YES/NO	This should be seen as a potential characteristic to make a DPS a suitable arrangement, but note, in the case of certain services this may see a higher individual unit price due to the nature of the service provided.
8	Would the type of services benefit from on-going competition around price / delivery due to on-going volatility in the market?	YES/NO	The greater the market sector volatility the potentially more suited is a DPS arrangement to help drive out value for money. The volatility could be driven by numerous influencing factors including commodity/product price and/or variable numbers of suppliers.

The underlying idea behind DPS is openness and flexibility. The DPS may be established for any period, but the time chosen must be given in the call for competition. (Arrowsmith 2018). The number of accepted applicants cannot be restricted. The DPS system remains open throughout the period of validity (James 2016). This allows interested suppliers to join at any time throughout the validity, not locking them out in the same way as in traditional framework agreements (Government Proposal 108/2016; James 206). The contracting authority can therefore have a large open list of tenderers in the system. In addition, there is less risk for the market to consolidate as the system remains open. James (2016) remarks that some seem to think that one benefit of the DPS is that it will improve competition through greater access to small and medium sized enterprises. One reasoning is that SME's can be attracted with the smaller contracts where requirements are not grouped by contracting authority to reduce administration cost (like in framework agreements). Though it is questionable whether a large open list of suppliers will support SMEs, as the chances of winning contracts are somewhat reduced. (James 2016).

The contracting authority is permitted to split the DPS into lots, if the lots are clearly identifiable. Appropriate selection criteria should be specified for each lot. The contracting authority will need to have a clue of the potential size of the market and how best to structure the DPS. In other words, contracting authority needs to consider how the DPS should be structured to ensure that DPS is manageable during the second phase. (James 2016) Every one of the procurements under the DPS must be put out to tender meaning that all the admitted participants are informed and invited to submit a tender for each specific procurement (Directive on public procurement 2014/24/EU).

The easier the application process is after the establishment of the DPS, the more responses will be received by the contracting authority. Even if tenderers are rejected it may be for a minor qualification detail which they can rectify through resubmission. (James 2016) The admission to the system only requires suppliers to demonstrate their suitability, ability, and capability to deliver the type of procurement in the DPS or a lot. The decision on the best value-for-money offering can only be decided at the tender stage for each individual procurement. The most time consuming and resource intensive part will be submitting a response under phase two i.e. the tender stage. (James 2016).

4 EMPIRICAL RESEARCH: ASSESSING KNOELEDGE WORK AUTOMATION TECHNOLOGIES FROM THE VIEW POINT PUBLIC PROCUREMENT

This section will outline the course of the research and its key components. Firstly, the reasons that led to choosing the case study method as an approach are presented. Secondly, the multiple-case design is discussed, and the five cases that were carefully chosen for this research are presented shortly. And thirdly, data collection and analysis methods are covered. Final chapters discuss the limitations as well as the reliability and validity of the study.

4.1 Research Methodology

Based on the research subject, the research questions, theoretical foundations and the data sources, **a qualitative case study method** was chosen as a strategy for this thesis. Eisenhardt (1989) defines case study as "a research strategy which focuses on understanding the dynamics present within single settings". According to Yin (2003) case studies should be preferred when the researcher poses "how" or "why" questions, when there is little control over events, and when the focus is on a contemporary phenomenon within real-life context. Reflected on this, the chosen method is justified. Robotic process automation and intelligent automation are contemporary phenomena which are studied in the context of public procurement and purchasing centralization. In addition, the researcher has little or no control over events studied. The character of research questions in this thesis fit also to Yin's description of when to apply case study strategy.

Dubois and Araujo (2007) suggest that research should aim at leveraging and extending our current knowledge along with revising prior understandings in the light of new knowledge. This means adding incrementally to the knowledge we have about the world rather than making broad generalizations from one study. This applies also to this study. The goal is to provide insights of a topic that is still relatively new and little understood - not to make wide-ranging generalizations. Case studies are valuable as disciplines can benefit from the development of examples. Case studies often serve that purpose, acting as a reference points for theory development as well as classic instances of particular phenomena (Dubois & Araujo 2007).

Eisenhardt (1989) points out that case studies typically combine different data collection methods such as archives, interviews, questionnaires, and observations. Evidence can be gathered by qualitative and quantitative methods. Yin (2003) suggests that the ability to deal

with a variety of evidence can be regarded as unique strength of case studies. Because of this, the case study as a research strategy forms an all-encompassing method and a comprehensive research strategy. On the other hand, Eisenhardt (1989) reminds that parsimony and frugality are hallmarks for a good research and theory. With a high volume of rich data, there is a temptation to build theory that attempts to capture everything (Eisenhardt 1989). In light of this evidence a mixed method research - with high volume of affluent data - might be weaker than executing a strong and focused qualitative research. It is anticipated that the reliability of the study is easier to assess when it is purely a qualitative opposed to mixed method research. Including quantitative aspects might prove to be too time consuming and the researcher should do solid research also on this area. This is considered hard as the sample size cannot be too wide. For these reasons the data in this research is collected only by means of different qualitative methods.

4.2 Multiple-case design

A case study can be established around a single case or multiple cases (Eisenhardt 1989; Yin 2003). Yin (2003) sees that when one has the choice, multiple-case designs may be preferred over single case designs if there are enough resources. According to Herriot and Firestone (1983) the evidence from multiple cases is often considered more convincing and the overall study may be seen stronger. Yin (2003) describes that in single-case design researcher "puts all eggs in one basket" and this can make the study vulnerable. The analytic benefits from having multiple cases may be more extensive. Additionally, Yin (2003) sees that the context of the two or more cases are likely to differ. If one can still arrive at common conclusions under these varied circumstances, the researcher has expanded the external generalizability of the findings compared to a single case alone. While the benefits of multiple-case design seem evident, it is important to choose each case carefully and intentionally, so that each case should serve a specific purpose (Runeson & Höst 2008; also Benbasat et al. 1987; Yin 2003). The cases should serve in a similar way as multiple experiments do, with either similar results (cases give support to each other) or contrasting results (cases cover different theoretical conditions). In the latter case, different results might be expected but for predictable reasons (Yin 2003).

The multiple-case design is seen to complement this research for few different reasons. Firstly, the technology is relatively new. It is expected that different sources have different viewpoints on the subject. Putting eggs in one basket as Yin express it, might lead to results that do not capture the phenomena. There is a handful of purchases in the public sector

concerning the topic and different purchasing methods have been used among the purchasing authorities. This alone implies that there are different angles to the subject. This confirms why multiple-case design supports the research. It is also expected that suppliers and purchasing authorities would have different perspectives to the subject. Observing the matter from one side will most likely lead to a one-sided result. Even though it is expected that there are differences among the cases, the interest of this research is also to look for the similarities and even try to point out a best practice if it is possible.

The cases that were chosen to this research are very shortly introduced here. The focus is on RPA as cases of intelligent automation were hard to find at this point. The central purchasing unit of the government is regarded as one of the cases. Three cases of public authorities were chosen as cases too, because they already had made RPA purchases and they have results concerning the use RPA.

4.2.1 Case 1 View from the suppliers and research field

There is already a good number of companies offering RPA solutions and services in Finland. This case includes the views of a couple of them. Finnish Tax Administration (Case 2) and HUS (Case 4) have the same supplier and this supplier was selected to be interviewed. Also, the preferred supplier of Hansel Ltd. (Case 5) dynamic purchasing system of IT consultation was interviewed as they offer RPA related services. Because these suppliers have been awarded contracts or are on the list of preferred suppliers, it is anticipated that they can be considered suppliers of highest quality and experience. The supplier of the Finnish government Shared Services Centre for Finance (Case 3) was left out from this study as it turned out that the initial supplier that was awarded the contract sold their RPA business to another company later. The new supplier was not interviewed as one of the goals was to receive supplier views from the public procurement and tendering procedures.

An interview with a Senior Scientist from VTT Technical Research Centre of Finland was interviewed as well as he had been part of RoboÄly project focusing on *"Public-sector development needs for robotic process automation and artificial intelligence – development needs of robotics and artificial intelligence from the perspective of information infrastructure"*. As part of their research they had interviewed RPA suppliers and public authorities.

4.2.2 Case 2 The Finnish Tax Administration

The role of the Finnish Tax Administration collects more than 50 billion euros every year in tax revenue, which is used for maintaining and developing public services. They employ about 5,000 professionals and serve customers i.e. the tax payers. These numbers suggest operations should be effective and systems are reliable. The organization is doing continuous development work to improve the services. The Finnish tax administration was chosen as a case because they have strong knowledge about robotic automation. The organization has used dynamic purchasing process to tender RPA.

4.2.3 Case 3: The Finnish Government Shared Services Centre for Finance and HR

The Finnish Government Shared Services Centre for Finance and HR (hereinafter referred as "Palkeet") provide finance and HR services for central government agencies, departments and funds, as well as state-owned businesses and fully state-owned limited companies that provide services for the Finnish government. They were one of the first government authorities to tender robotic process automation and the organization sees that digitalization, process automation and the use of data in management will have an immense effect on the development of finance and HR administration in the near future. Palkeet has built own competence around RPA and they have developed an RPA deployment service to be offered to governmental agencies. Palkeet was chosen as a case because they have experience about RPA and conducted RPA procurement using a negation procedure in the tendering. Furthermore, Hansel Ltd. acted in the RPA procurement in a consultative role.

4.2.4 Case 4 HUS - The Hospital District of Helsinki and Uusimaa

The Hospital District of Helsinki and Uusimaa (hereinafter referred as "HUS") is a Joint Authority formed by 24 municipalities. The aim is to offer specialized medical care to all member municipalities and their 1,6 million inhabitants. HUS has more than 22,000 employees and is one of the largest employers in Finland. HUS Logistics acts as a joint purchasing unit of the municipal federation and provides for the logistics services. HUS Logistics is one of the largest public procurement units in Finland and competes with the procurement of medical equipment and supplies, furnishings and various care or support services in the hospital. HUS has also an IT management as a support service which has been involved in the procurement of RPA. HUS has set up a framework agreement of

robotic process automation service in purchasing collaboration with other contracting entities. Another reason why this made an excellent case for this research was that HUS Logistics exercises joint purchasing with the similar objective as Hansel Ltd. (Case 5) i.e. saving resources from the members or inner customers.

4.2.5 Case 5 Hansel Ltd.

Finnish government uses centralized purchasing unit, Hansel Ltd., to reduce public expenditure by increasing productivity in government purchasing. The central purchasing agency negotiates framework agreements or sets up dynamic purchasing systems in selected product and service categories for the use of its customers. The aim is to reach lower prices through volume discounts, provide appropriate quality and reduce overlapping work among the government organizations. In addition, the agency offers tendering services to support government organizations in specific and individual purchases that cannot be acquired through framework agreements. Purchasing agency does not have a framework agreement or a dynamic purchasing system specifically for knowledge work automation technologies such as robotic process automation or intelligent automation. Importantly, Hansel Ltd. was chosen as a case because it could possibly generate synergy benefits.

4.3 Data collection & analysis

The primary data was collected by interviewing procurement professionals, robotic process automation suppliers and a researcher in Finland during October and November 2018. Also, RPA workshop was participated to receive better understanding of the subject. The details of the primary data collection are given in Table 5. Secondary data to support the empirical findings was collected from several different sources, including tendering documents and reports. These served as additional background information.

The purpose was to gather data from different perspectives. First angle was the supplier perspective and purchasing authority perspective. Second angle was different purchasing methods as RPA has been put out to tender in different ways: framework agreement, dynamic purchasing system and negotiated procedure. It was important to gather data from all of them. The goal was not to find out which style suits best to purchasing units of RPA or intelligent automation, but rather to find out if it is possible to determine best practices and if there is a path that centralize procurement unit can choose. In this research all options or purchasing methods that have been "tested" are taken under analysis. The data was

collected from multiple sources in order to provide the best possible understanding into the topic.

Table 5. Collection of primary data

Date	Organisation	Title	Duration	Type
16.10.2018	Hansel Ltd	Category Manager	56 min	Face to face, recorded
16.10.2018	Hansel Ltd	Legal Counsel I	63 min	Face to face, recorded
18.10.2018	Tax administration	Legal Counsel II	66 min	Face to face, recorded
18.10.2018	KnowIT	RPA Lead Consultant	65 min	Face to face, recorded
29.10.2018	VTT Technical Research Centre of Finland Ltd	Senior Scientist	67 min	Skype interview, recorded
31.10.2018	HUS Logistics	Project Manager	56 min	Face to face, recorded
14.11.2018	Digital workforce	Digital Revolutionist	99 min	Face to face, recorded
28.11.2018	The Finnish Government Shared Services Centre for Finance and HR	Development Manager	58 min	Skype interview, recorded
Other				
24.11.2018	Solidabis	Process consultant, Lead consultant	6 h	RPA workshop

The data collection was conducted in four phases. The Phase 0 took place in 2017 in Hansel Ltd as a project work. Our project team examined the possible implementation subjects of robotic process automation and intelligent automation in the field of public procurement. The study focused on how this type of automation could be utilized in the beginning of public procurement process and how contracting authorities as wells as tenderers could benefit from this technology. Even though the project had a slightly different focus to the subject of RPA and intelligent automation, the background work that was conducted at that time helped to identify the need for this research. Also, the recent cases of RPA in public sector were identified in this phase and relevant literature as well.

The aim of data collection phase 1 was to gather information of the subject matter (RPA and intelligent automation). Two companies offering RPA services were chosen to be interviewed. Furthermore, the chosen companies are suppliers and preferred suppliers in some of the cases presented here. It was anticipated that they would have experience of participating in public tendering and have knowledge of the needs of public sector. In addition, a senior scientist of VTT Technical Research Center of Finland Ltd. was also interviewed about the subject matter.

In the data collection phase 2 the data collected from the early adopters/forerunner organizations of robotic process automation in the public sector. The aim was to gather information about their observations of purchasing robotic process automation.

Data collection phase 3 focused on the governments central purchasing unit and what different paths it can choose in order to support other purchasing entities in public sector.

Data collection and themes covered are presented here:

DATA COLLECTION: PAHSE 0 *preliminary research*

Subject: RPA and intelligent automation in public procurement

Themes covered:
- information about RPA and intelligent automation
- Identifying the first RPA cases in public sector

DATA COLLECTION: PHASE 1 *interviews, documents, reports, RPA workshop*

Subject: Suppliers of RPA and VTT Technical Research Centre of Finland Ltd

Purpose: Gathering information of RPA and intelligent automation and how to procure it for the public sector

Themes covered in the interviews:
- additional information of RPA and intelligent automation
- RPA markets and development
- experiences of public procurement

DATA COLLECTION: PHASE 2 *interviews, documents*

Subject: Forerunner organization that have tendered RPA in public sector

Purpose: Observing the RPA journey and learning points.

Themes covered in the interviews:
- how the RPA journey was started
- RPA as a subject of procurement
- what should be considered in tendering RPA
- experiences from the tendering procedure chosen

DATA COLLECTION: PHASE 3 *interviews, documents*

Subject: Central purchasing unit

Purpose: In what different ways central purchasing unit can give support to other purchasing entities

Themes covered in the interviews:
- do purchasing entities need help in RPA procurement?

- what are the different alternatives for giving support?
- what are the challenges?
- what are the benefits?

Interviewees were selected based on their knowledge about procurement or RPA or both fields. The interviews were conducted as semi-structured and as single-person interviews. All interviews were recorded and transcribed for analysis. Data analysis began with a within-case study. Eisenhardt (1989) describes that the overall idea behind within-case study is to become familiar with each case as an entity. The process allows unique patterns of each case to emerge before moving to patterns across cases (Eisenhardt 1989). Data analysis was continued by the means of comparing the cases. It was expected that the subject is complicated, and interviewees have more knowledge on either RPA or public purchasing, so the data collected from the different cases would reinforce each other.

The whole transcribed material was gone through and emergent themes were coded in the margins of the transcribed notes and then compared. Frequent themes were picked up from the interviews to recognize common dimensions cross the cases. The reason for the use of cross-case analysis was to deepen understanding and explanation. Another function for it was to compare and search for similarities and differences across cases and also in contrast to theory.

4.4 Limitations of the study and review of qualitative case research

The fact that the thesis combined public purchasing and a recent technology as subject matter was challenging as there were not many interviewees that would have strong expertise on both subjects. The interviewees had different backgrounds, so even though the questions were quite similar, the contents of the interviews were very different. In other words, different topics produced varying amount of discussion between the interviews. Relying mainly on the interviews means that the results are based on the opinions and assumptions of the interviewees. As there is not that much academic literature available it is was challenging to do cross-validation in some parts. The knowledge work process automation technology is quite new, and it is still advancing. The intelligent automation can be called emerging technology. Finding reliable and up to date academic literature on subject was not easy.

The study was conducted as a multiple case study. One interview per each organization was arranged (Hansel Ltd. being an exception). Secondary sources of information were

also used, mainly tendering documents. However, it would have been interesting to do a few more interviews inside the case organizations in order to have more depth in the analysis. Having a larger sample of interviews would have contributed to the validity of the findings. That said, the multiple case-study is very resource intensive as Yin (2003) points out and it was noticed during the study.

The research is limited to few of the forerunners using RPA in the public sector, purchasing central unit and the suppliers and a researcher. No further attention is given to the need's analysis of governmental organizations in larger scale. A deeper analysis of the needs should be done when deciding if joint procurement/centralized purchasing should be set up around RPA in the public sector.

The use of reliability and validity are common to evaluate quantitative research. There have been attempts to better understand what these terms mean from the quantitative research perspective (Golafshani 2003; also Stenbacka 2001). According to Beverland and Lindgreen (2010) reviewing of qualitative case research can also be also analysed through positivist quality criteria for case research: construct validity, internal validity, external validity and finally reliability. By contrast Golafshani (2003) sees that the most important test of any qualitative study is its quality. A good qualitative study can help understand a situation that would otherwise be confusing. Quality concept in qualitative study has the purpose of generating understanding. Golafshani (2003) add that many researchers have developed their own concepts of validity and often try to use more appropriate terms such as quality, consistency and trustworthiness. Stenbacka (2001) concludes that in qualitative research "reliability as it is traditionally being used has no relevance, whereas validity, generalizability and carefulness have different but distinct meanings in this context". Based on this reasoning, Stenbacka (2001) provides the following rules for qualitative research:

– the understanding of the research subject is valid if the informants chosen are part of the problem and interviewees have opportunity to speak freely to their knowledge structure
– a thorough description of whole process indicates quality
– analytical generalization (distinct from statistical) which is made possible by strategic choice of informants
– A systematic and careful description of the whole process.

These rules were followed during the research. As in all case research, there is a limited possibility to generalize the results of this study. However, this research aims more

importantly at leveraging and extending current knowledge than generalizing the results. Generating understanding around the topic is the purpose of this master's thesis.

5. RESULTS

This chapter will introduce the findings from the five cases that were selected for this research. The first case, which purpose is to describe the knowledge work automation field, consists of findings from the subject matter and development, the supplier markets and also the experiences from public tendering processes from the supplier point of view.

The three RPA cases of purchasing units (the cases 2, 3 and 4) describe different paths that purchasing unit have taken in their RPA journey. The cases chosen were considered most appropriate as the organizations have experience from RPA and every case brings a different angle as different procedures were used for tendering. The case 2,3 and 4 serve as background and a benchmark for the government's purchasing unit (case 5).

5.1 Case 1: View from the suppliers and research field

RPA markets

According to the interviews the market of RPA has grown in the past three years in Finland remarkably and there are different types of suppliers. In a way two markets exist: the software market and the service market i.e. reseller market. The first bunch includes the suppliers that have developed RPA technology and the second includes the consulting firms that offer different technology solutions and services to customers. Both markets have multiple suppliers. Digital Revolutionist remembered that in case of the Finnish Tax Administration's dynamic purchasing system there were 14 suppliers. RPA Lead Consultant estimated that the actual number of suppliers that offer RPA services can be easily be dozens in Finland. The interviewees reported that global consulting firms are in the business and smaller suppliers that have provided other services before, have added RPA in their offering. RPA Lead Consultant saw that suppliers that could be purely profiled as RPA supplier above all are rare, at least in Finland. Nevertheless, it was anticipated that a purchasing authority will receive multiple good tenders to their call for tenders about RPA.

There are multiple suppliers offering RPA technology i.e. the platforms. However, the number of different platforms available on the market in Finland, is only limited to two - that

is the two market leaders UiPath and BluePrism. On top of these commercial platforms there is a new open source challenger (Robot framework).

Digital Revolutionist considered that the growth has been wild in the past years and there has been room for suppliers in the growing markets. When Digital Work Force started, they were only few others in the market, but the situation has changed. The RPA market is most likely to grow in the future too, but now the market is more established. The growth is shared most likely between the existing suppliers as any newcomer would need to have a new angle to their offering to be able to compete.

> *"A newcomer, would have challenges -- the existing players have developed their services during the past years and are starting to excel in what they do."* (Digital Revolutionist)

> *"There is still room in the field, but it can be anticipated that no newcomer would build business solely around RPA. However, one cannot say that "been there, done that" [about RPA]. -- There is so much hype around artificial intelligence and expectations towards concrete implications regarding it. Therefore, it is unlikely that any newcomer would focus only on RPA. They would probably have some new angle to it."* (RPA Lead Consultant)

Digital Revolutionist mentioned that the RPA market is more established and artificial intelligent is a few years behind. The latter being a very different type of market. The fact that the terminology is not established illustrates the lower maturity level of the AI market and also from the vast scale of the field. In addition, the AI market is split into very thin segments. The AI suppliers offer very field- or application -specifically developed solutions meaning that suppliers can be found only from single segments. Therefore, there is no solution available that would serve all AI needs of the organization.

The Digital Revolutionist mentioned that in comparison, the RPA market is such that any supplier could answer to the general RPA needs of an organization. There are generic RPA platforms which will go far, and some work is needed on top of that. The RPA solutions are generally applicable to business problems that are being solved with the technology. Process consultant saw that robotic process automation is not just a hype but proven technology. Intelligent automation it is still further away, and the realities are not yet in place. It is emerging and there are first pilots going on about cognitive robots.

RPA compared to AI

In all interviews it came evident that RPA and generic AI are very different genres. It was also seen that use-cases are also very different with RPA and AI.

> *"Sometimes you hear such statements from managers that they will not jump on RPA because artificial intelligence and other solutions are coming shortly, and they will wait for those. Technologies [RPA and AI] answer to different needs and they are not the same thing. Moreover, it is foolish if somebody thinks that they'll wait and sit five years for the ready-made solution to be brought in and installed on a server to do something."* (RPA Lead Consultant)

Senior Scientist explained that RPA is technology, that enables automation of routine task that are executed with different software. In contrast artificial intelligence (AI) is very broad term and very multidimensional. It cannot be specified that AI means one certain specific thing - rather it is a compilation of different approaches and technologies. It can also be crystallized to a notion that systems and software work in a sensible way according to the situation and task. The Digital Revolutionist described that in a way, RPA is very simple in its ideology - that is, the robot is put out to do the same routine work as a human worker would do and the rules are very simple to describe in the end. The problem is much more limited than compared to artificial intelligence. Also, the work amount included is in another level.

> *Typically, it requires 10-15 working days to make an operational RPA robot. Compared to AI, it might take 50 or 100 working days for to build a workable application on top AI platform. This can be a result from low level of maturity in a software, but in principle there is difference between AI and RPA"* (Digital Revolutionist)

According to the interviews, the basic RPA does not have intelligence. The robots are given instructions to repeat a routine task. That is, everything needs to be spelled out for the robot. However, it was considered that RPA is still on the development curve. The RPA technologies are likely to be improved to be smarter and easier to use. Suppliers are working on how giving instructions to the robots would become easier and how RPA could learn about the process or deviations. It was considered that RPA and AI are integrating in the future.

> "*There will be many more features and self-learning systems - including AI features - brought to RPA tools. Above all, RPA integrates with AI tools and various data analytics tools. These form up an ecosystem. Suppliers create infrastructures that have plug-ins ready for artificial intelligence or data mining tools*" (Digital Revolutionist)

> '*'One trend is that AI modules are brought to RPA as one attribute. There are two paths for integrating RPA and AI, either the RPA supplier develops AI modules by itself or the RPA suppliers collaborate with an AI supplier which will offer their AI component which is integrated to the RPA solution. It could mean RPA takes care of the routine work and then AI would be needed to make interpretations and predictions in situations when there is a task that RPA cannot handle."* (Senior Scientist)

When asked about intelligent automation, Digital Revolutionist told that they use the term intelligent process automation, which refers to new functionalities added to the basic RPA platform. It can be described as a system that can appear more intelligent meaning that RPA gains more skills such as image and text recognition skills. Today basic RPA is structured and rule-based and for a robot a picture is a poison-like data. In addition, robots cannot understand natural language. If natural language processor is added, it is then possible for the robot to understand from the structure of the language - what the text is concerning and what is asked in the task.

Integrating AI to RPA was not considered problematic. RPA can be integrated with other solutions to enhance the business value.

> "*The strength of RPA technology is in integration. It does not do anything on its own. Everything it does is about connecting something. RPA tools have open interfaces."* (Digital Revolutionist)

It was seen that using RPA is not a foundation or basis for using artificial intelligence (Senior Scientist). On the other hand, in one interview it came up that RPA can be seen as the first easier steps that company can make towards other more intelligent solutions. RPA is a subject where you advance in stages, start small and then build up. It can be anticipated that the organizations that have started first with RPA and have gain experience from this path, have better grounds to move to more intelligent technologies.

The different RPA technologies

When speaking of different RPA technologies, it was considered that there are some differences among them. The choice between the technologies depends of the needs of the organization.

> *"Everything starts from the needs behind purchasing and what features are relevant to the organization… All RPA tools are functioning, you don't need to worry about that. More significant is to understand what the problem is that you need to solve"* (Digital Revolutionist)

> *"…depends what kind of process and business environment the robot will be used and how it works. Whether it is scheduled to operate on specific time versus a situation when someone activates it when needed. If the robot is needed on your own laptop and the user will activate the robot, then a different technology is more suitable."* (RPA Lead Consultant)

Digital Revolutionist describes that there are three top commercial RPA technologies or platforms: Blue prism, Automation Anywhere and UiPath. Automation Anywhere is not typically seen in Finland as there is lack of representatives here.

> ''*Even though there would exist the best RPA technology, you should not choose that if there is no local retailer or support service. It is doomed for a fail if you have a technology that no one can use.'''* (Digital Revolutionist)

That leaves UiPath and BluePrism, which are very similar. The differences come from the background and the weight given for different features. BluePrism originates from the banking sector. The features that have received weight are the security and managing vast numbers of robots. The outcome is made very user friendly and coding background is not necessarily needed. Vice versa it is not necessarily ideal for those who are experts in coding. Some things you can bypass, but it can feel a restricting for those with coding experience. UiPath has its background in macros and scripting (scripting is a code used to give instructions to programs that are running on a computer). If you are a coder you might prefer UiPath from BluePrism as you can exploit the scripting experience you have. Both meet basic information security requirements. BluePrism is good if there are corporation

structures that set requirements for access (for example if affiliates do not need to see each other's data). UiPath is not so good at this.

Regarding the issue of customization of the product it was found to be very slim.

> "*There is not much customization done as such per client. The processes are unique for each client and the robots purchased have to be educated individually. Of course, the choice between data centre or cloud services is one choice. These are options that the customers IT policy will dictate.*" (RPA Lead Consultant

It came up in all interviews that an open source RPA solution called Robot Framework has entered the market as a challenger for license products. Originally, Robot Framework is a generic test automation framework and the RPA platform was introduced in summer 2018. However, there was a little controversy among the interviews, whether it has all the features (such as management of the robots, recovering them from errors, processing log data) of the RPA license products at this point. But there was no question whether the same features (if not yet in place) are coming sooner or later as Robot Framework is developing.

It is not ruled out that an organization could not have different RPA technologies, use different kind of robots and purchase services from different suppliers, but then the organization should know what it is doing. IT will require more from the organization compared to a situation where there is only one platform used.

> "*Other organizations have more than one RPA technologies in use permanently. In this case however, the company needs to have a reason for that for example different types of processes. Some organizations in the banking sector have acquired the platform from one supplier, then they have internal developers or developers from a second supplier and the maintenance can come from a different supplier. In this type of situation, the organization needs to keep the keys in its hands and have control.*" (RPA Lead Consultant)

The Lead RPA consultant saw that all solutions whether they are commercial or open, need coding if the goal is to have operational reliability. Commercial products can be used in a lighter method, but code can be also written. And of course, the open source platforms need coding experience.

> *"The more code is possible to be written and the more technical skills the developer has, the more reliable -- we speak of "robustness" which refers to the degree of operational reliability and how stable the performance is."* (RPA Lead Consultant)

The interviewees mentioned that in the most straightforward case you can use a tool to record the process human is doing and after that, the process can be run as such. Yet, this kind of robot is considered weaker meaning that is lost if the user interfaces are updated in the systems (e.g. fields change their places or other elements are added). Similarly, if you do a mistake when recording a process or a task for the robot, your mistake will be repeated by the robot every time - again and again. When speaking of best practices, it would be advised not use the recording.

Even though it is sometimes advertised that RPA robots can work non-stop and continue without sleep or vacations, in reality it does not necessarily go quite like that.

> *"Hardly any organization can have the robots working 24/7 as there can be maintenance breaks or updates in the night time or robots work in processes where it does something and then the human needs to step in for a while and after that the robot can continue.* (RPA Lead Consultant)

Cloud Services versus on-premise

It was seen that cloud services are available and for many organizations it is a good solution unless there are specific reasons to use on premise-solution, for example in Tax administration's case it was necessary to place it in Government's ICT centre's (Valtori) data centre.

> *"Cloud computing is quite transparent in cost terms, so you know what you get. There is a clear monthly cost, which can be budgeted. And it is the supplier's problem if they gave the wrong estimate. The license solution means work for the organization. It is a rather heavy platform. That is, not one server and one program installed, but three-tier architecture, load balancers, SQL databases that by themselves means 30,000 euros investment per year unless purchased for any other purpose -- It is rather big investment before any automation is actually made."* (Digital Revolutionist)

Usually organizations start out with a trial. Cloud service can serve as a much more scalable solution. Robots can be purchased one at a time and even at a minute price, as HUS does. In addition, the world is heading more and more towards the cloud services - it was considered that this can be recommended to the public sector warmly. The Digital revolutionist did not see anything that could not be done in the cloud. If there are higher requirements for security a dedicated cloud or private cloud is possible.

> *"For one customer, Digital Work Force is drives 200 robots as a cloud service, so if someone says bigger stuff can't be done using cloud services, then this shows that it is possible. There is no limit to that."* (Digital Revolutionist)

Both, cloud services and on-premise solutions, have been seen in the public sector. It was considered hard to say which one is more common. On-premise solutions are being used for example by the Tax Administration, Kela and the Finnish Defence Forces with high security standards. But many organizations use cloud services, especially smaller operators who do not have the ability to do RPA themselves and build a heavy platform. As it was mentioned HUS buys at minute prices, which seems to be an upcoming trend. Traditionally, cloud services have be bought on monthly basis, but gradually we are heading towards an hour or minute salary. That is, service can be purchased on-demand. The actual idea of cloud service is that the service can be scaled up or down at any time.

Matters to consider

Lead consultant and Process Consultant highlighted that automating processes is linked to improving processes. Likewise, improving processes is equivalent to developing business. The underlying idea is to improve the method of doing things and generate value to the customer. If business process management is done in an organization, it often involves using technology.

The interviewees mentioned that the technology to improve a process does not have to be RPA. It can be any technology and sometimes leaning or streamlining the process would be a better solution. So before planning to jump on RPA markets in purchasing frenzy, it might be a good idea to crystalize what are the needs of the organization and what are the different options to fulfil them.

> *"Technology should never be procured to achieve more technology in the organization. In other words, RPA solution is only a means to an end."* (RPA Lead Consultant)

> *"One needs to understand that it is not only about business processes or technology, it is about the combination of both"* (Digital Revolutionist)

> *"Neither RPA or AI is the absolute value in itself - the business problem is"* (Digital Revolutionist)

Lead consultant mentioned that software robots are part of the process, they cannot be used to automate business process from start to the finish line. Humans need to have the big picture of the process. It must be also remembered that RPA is not a strategic tool, but a tactical one. In addition, interviewees reminded that process automation is always a change project in the organization, because the technology changes the work of humans (and hopefully in a positive sense). If the employees are not committed to the technology, then additional workarounds are implemented making the process inefficient.

According to Senior Scientist RPA and intelligent automation can be seen as part of digitalization. And just like introducing any other new technologies in the organization, the support from management is one of the most important success factors. Organizations need to think how they introduce knowledge-work automation. There are even examples where organization try to make the RPA robots seem more humane and non-threatening by giving the robots names and keeping them retirement parties.

One important topic that came up in the interviews was the degree of knowledge required inside the organization. The Senior Scientist saw that the scale of RPA dictates what kind of knowledge is needed - doing some small pilots of RPA versus large-scale implementation. The latter demands that there is new competence build in the organization or purchased from a third party. Digital Revolutionist commented that very few does everything by themselves and similarly very few outsources everything. The latter option cannot be recommended.

> *"The organization must have some kind of RPA team - this can be from 2 persons like UPM up to 50 persons like Nordea has, or something between these numbers. The size [of the RPA team] depends on the operating model. An internal sponsor should exist from the management and someone to lead the RPA team, coordinate and market internally. To what is outsourced from this point onward, different models exist. It depends on the culture of the organization and where you want to focus.* (Digital Revolutionist)

The vision and goals dictate what the scale of RPA is going to be in the organization.

> *"The essential step in the beginning is to think what the vision is, and what are the goals related to RPA. And what are the benefits that are aimed at. -- These choices guide if it [RPA] is just a trial or something that is systematically introduced company-wide."* (RPA Lead Consultant)

Another topic was what type and degree of knowledge that needed inside the organization. It is important to analyse what knowledge is required inside the organization. Interviewees brought up that strong process knowledge is important. In addition, RPA Lead Consultant highlighted the importance of technical skills or coding knowledge as there are things you should know to make reliable robots.

> *"RPA is branded strongly as simple, agile, visual and that everyone can learn to automate processes -- yes, but another question is it good for production and reliable…. It is not enough that somebody uses hour a day to learn this type of coding of robots. There is simple to use RPA, but if you really want to benefit and develop your RPA, then you need a specialist. The problem is that RPA has got the reputation that it's possible to use by anyone with minimal coding experience."* (RPA Lead Consultant)

Digital Revolutionist considered that person doing the automation should understand the best programming practices. The tools with graphical user interface are not technically so difficult, but if you do not know how to operate them in the most reasonable way, you can be in big troubles later in the maintenance phase. One example could be that you have 100 robots using an ERP system and the log-in page of the system gets updated. If you have given instructions to each robot separately how to log in, you have to give instructions again all over again to every single one of them. There are certain things in RPA where you can blunder.

Starting with RPA

There is a lot of RPA talking, a lot of RPA suppliers and a lot of RPA promises. It was recommended in the interviews that before starting the actual tendering, organization would start a discussion with suppliers, survey or even try out the different technologies to find out what is suitable for the organization and its processes.

Senior Scientist brought up that based on their research that the most favoured approach seems to be experimental, advancing with small steps and one that involves doing pilot projects. The important thing is to gain knowledge and understanding as well as find out the needs of the organization through experiments.

Digital Revolutionist considered that there are two ways to start thinking about software robotics when you're right in the beginning. One option is to do a so-called potential assessment to evaluate the overall potential for RPA. This sort of preliminary study should also include whether there are any boundaries that come from IT architecture or systems. The preliminary study helps to understand what the field of activity is in the organization and what is the potential for RPA at a rough level. This will reveal whether RPA is a big or a small thing for the organization and whether it is something the organisation wants to invest in. The preliminary study may have purely internal perspective or include market surveys and inquiries of what others have done. The second option is to conduct a pilot. This means that experiences are collected; how RPA feels, how it works in practice and what kind of tools there are. Digital Revolutionist pointed out that The Finnish Tax Administration did both - the potential assessment and the pilots or proof of concepts.

A proof-of-concept requires an explicit task or a process which is automated. The proof-of-concepts are good approach if the organization does not necessarily know what things will arise.

> *"…automation can be tested in the organization's own environment. What it means in their environment. It is important to gain knowledge where it is applicable to use and where it is not. (…) This view was shared with the organizations and the suppliers in the interviews."* (Senior Scientist)

> *"Some organizations test and try out different technologies for their processes. After these experiences and results they make the final decisions of RPA technology or technologies. This is can be considered as a good approach."* (RPA Lead Consultant)

However, it was mentioned that the pilots do not happen by themselves, they too require resources and worktime. Unexpectedly it can be a project of half a year. If the needs are critical then the organization might want to verify that the technology is right for them.

It was also advised that the purchasing entity should contact other organizations that have used RPA before to receive experiences. *Senior Scientist* mentioned that the need to share more information and experiences came up during their researches. Public sector authorities wished for more information about the RPA technology, the application, what are the prerequisites for the use and who already has RPA experiences (peer review). They felt that the knowledge is still scattered, and the organization must start collecting it by themselves. Typically, the public authorities are willing to share information, but it is a matter of finding out the right directions.

Interviewees considered that seeking experiences of others is advisable as there are already organizations that have used RPA and they have experiences of the solutions available in the markets. It is possible to enquire what were the challenges in their tendering process and what went well. However, if materials are shared, these should be observed from the own needs of the organization, instead of copying the requirements of others.

> *It should be remembered that there is no such thing as best practice - for example that the call for tenders of Tax Administration would fit for everyone. Not necessarily suitable. It can be too heavy, and the requirements were pretty high"* (Digital Revolutionist)

One point that came up in the interviews is that organizations cannot just purchase RPA and leave it to that. Making an RPA strategy and an operating model is necessary if the purpose is to use RPA systematically. What also was mentioned in the interviews is that the robots need maintenance and further development. This stage will continue beyond the deployment.

Not all costs come from purchasing services. A big part of the cost of robotics is from thinking about the processes. These are often internal costs. That is, pondering internally about doing things this way or that way before starting to put the instructions on a document.

Tendering RPA

The interviewees considered that when tendering RPA, the most important is to start from the needs of the organization and the goals of the organization. The needs should guide how the call for tenders is created. There should be understanding and some knowledge

about the RPA in the organization to go through the tendering process. RPA cannot be put out to tender just like the other software.

> *"Whatever you do, it is not advisable to take the basic software procurement templates. This subject really requires reflection and thought. You are procuring an automation platform that comes with a lot of development work, not off the self -software that is installed and then there is some help desk to call when the problems arise"* (Digital Revolutionist)

The degree what is done by organization and what is outsourced came up in the interviews as mentioned earlier. Digital Revolutionist saw that organizations should also consider these issues in the tendering competition. It is expected that the degree of services bought from third party can change over time. It takes time to start the RPA journey and put up an operating model for RPA.

Flexibility and scalability are important to take in to notice in the tendering. It was advised not to lock too tightly into a particular model as there is change likely to happen. It would be sensible to somehow leave freedom of action especially if you have a long contract.

> *"When you start learning the new tool, the wheel will start to run at a slower pace. Suddenly, it can be half a year or a year before you are really in full swing. After that, there becomes new needs, requiring new licenses and specialist resources from the supplier. That is, the purchasing model must be flexible enough to allow different ways to operate at a different time -- The rules should be set in a sufficient level."* (Digital Revolutionist)

> "*You should get into practice, but so that the costs do not come straight into your arms... a model where licenses can be purchased for individual robot -- a* scalable model should be thought. Pricing should be scalable from one robot to hundreds of robots" (Digital Revolutionist)

> *"The technology is still developing so one point when figuring the different possibilities to procure is that one does not tie oneself for too long.* (Senior Scientist)

It is more explicit what RPA a means compared to AI, but still it was advised in one interview that the procurement authority describes what RPA means from their organization's perspective and in the operational environment of the organization. RPA Lead Consultant considered that most customers have already thought of use case for RPA in advance. In

the public sector the tendering materials usually have description of use cases where robotic process automation is planned to be used.

> *"...making a video of the processes is an excellent way to demonstrate what is expected, what is needed from the technology, what systems the robot will be using etc."* (RPA Lead Consultant)

The requirements for the technology should be thought carefully from the organization's perspective. It was considered that when you have understanding from the different tools, it is easier to justify which features are important and unconditional and what does not matter. Thus, you can put the right requirements in the invitation to tender.

The requirements should be in line with what is needed. An example of incoherent requirement came up in one of the interviews.

> *"If the requirement is that the purchasing authority wants license-based product that can be used through graphical user interface, then this rule out the open source platform. One could ask what the value from graphical user interface is if the organization still acquires services from supplier to use it."* (RPA Lead Consultant)

Digital Revolutionist reminded that when planning a tendering competition, it is good to choose either a license or a cloud service. If purchasing authority gives the opportunity to offer both, then the customers licenses cannot be utilized in cloud computing, it is technically impossible. In the case where purchasing authority gives the opportunity to offer either cloud service or on-premise, then there should be enough freedom to do this.

The requirements for RPA specialists performing the service should be reasonable as there are no specialist that would have years of experience from RPA and all qualities do not consolidate in one person - it is more about the team work.

> "*The public procurers should understand that the line of business is quite young, which is the reason why it is absurd to demand 5 years of experience from RPA from specialists. Even two years of experience is quite much to ask at this stage. There is not many who would have that experience in RPA projects."* (RPA Lead Consultant)

> *The suppliers do not have MacGyvers who can master robotics from a to z and have expertise in training and mentoring. It's more about having a good team; a technical specialist, a programming specialist for robots, one for the training of analytics and one for identifying processes - features do not merge in the same person.* (Digital Revolutionist)

In addition, the references asked from the suppliers should not be too strict. Demanding experiences from a specific business field is exaggerated.

> *"The suppliers start to have multiple references of RPA, but the references from a specific business field are quite unreasonable. This is not very business sector dependent technology. Especially the process that are typically automated, like human resources or financial administration, are very similar no matter what the line of business is."* (RPA Lead Consultant)

The contract period should be long enough as the first year goes to learning and the second year is when things start happening. What happens after the contract period creates challenges in the public sector as the procurement should be tendered again.

> *"The follow-up contracts awarded by competition are a problem if you have already done it with a particular platform. The automation itself is platform-specific. That is, it is not possible to transfer automations done with UiPath to BluePrism. It must definitely be possible to define the need to support these [existing] automations and develop them, otherwise there is a terrible point of discontinuity and a huge cost to write everything from start."* (Digital Revolutionist)

When asked about the joint procurement it was considered to make sense. It was regarded that the small and medium-sized organizations do not necessarily have the business case for RPA by themselves.

> *"The potential savings in percentages from RPA is greater in large municipalities than in the smaller ones. The small and medium-sized municipalities would benefit if they would collaborate with each other"* (Senior Scientist)

Also, the notion of saving resources came up.

> *"Collaborative competition can in itself make sense as not to waste resources. Competitive tendering in small entities makes no sense. The government can put out to tender for an entity and within it limits subunits can flexibly procure each unit according to its own needs and schedule."* (Digital Revolutionist)

> *"Dynamic purchasing system seems to be a good idea and a competent. The procurement unit is doing a short list. Facilitates actual bidding but gives some kind of framework. The tendering competition can focus on the matter itself, the other side is taken care of (suitability of tenderers, etc.). Tenderers will automatically receive invitations to tender. Dynamic acquisition can be included with artificial intelligence."* (Digital Revolutionist)

Pricing structures

As mentioned before, there are commercial license products, cloud services and open source products in the RPA market. There are obviously differences how pricing is structured between these. Significantly, even the license products have very different pricing structures compared to each other. And this brings challenges when planning a public tendering and designing the price comparison.

> *It is essential to design call for tenders so that you will receive truly comparable prices as there are different pricing models -- No hidden cost items and with easy to compare and understandable pricing. The model Finnish Tax Administration used was good and comparable. They had all the necessary components.* (Digital Revolutionist)

> *"Whatever the procurement procedure is chosen, you need to pay attention to the price comparison, so that you get a price where everything is taken into account, that there will be no unpleasant surprises later on. It has also been seen that, for example, the price of test licenses has been forgotten from some of the call for tenders, which may be a small surprise later. Test licenses are needed more than production licenses, which means that the cost of € 10,000 a year is something that should have been taken into account"* (Digital Revolutionist)

What is also important to notice is that licensing models are quite different from the so-called end-user software, where you pay 100 € per user a year or purchase a perpetual

license. Regarding the license products, RPA Lead Consultant explained that there usually is a developer license to the development environment where the robot is trained and tested. And then there is a separate production license for the robot operating in production environment. The production licenses are the ones that are more expensive. However, one production license can hold several processes if the organization and its processes are the type that the robot can manage several processes during it work hours. This depends on the volume and how long the processes are. Obviously, this makes the estimation of needed number of licenses quite hard beforehand.

Similarly, Digital Revolutionist concurred that the forecasting of required capacity i.e. number of working robots is challenging in advance. It is challenge calculating how many processes the robot can run as it varies. One robot can run 100 processes, or one process can be run by three robots. The logic is that one robot does the work of multiple people counted in work years. One robot does not replace you as a person but replaces a part of the input that can be converted into work years. So, it is possible to calculate how big contribution one robot makes in work years. What it means in the number of processes depends on the size and time criticality of the processes (run at the same time or one after another). For these reasons the calculation is not that 1000 users equals 1000 licenses.

Instead of only focusing on inspecting the prices of different licenses, procurement authority should give attention life-cycle costs and evaluate total cost of ownership (TCO).

> *"There is a difference to a standard ready-made software solution, that has some application management - usually a rather small component. Maintenance at RPA is really a big component. we call this "run management". That is, it is supervised that the robots start up, they do the job they are meant to do, and small technical changes are made to them. A little fine tuning. If the robot stops, you need to check what's wrong. Target software can change and there can be hundreds of target software which are updated all the time."* (Digital Revolutionist)

According to the interviews, robots must always be maintained, and this continues until the robots are retired. It was considered as a surprisingly high price component in relation to more static software acquisition. Considering this, it is noteworthy that enough weight is given to run management and attempts are made to make total cost of ownership transparent.

> *"If a license costs is asked for 48 months in the price comparison, then they will clearly dominate. It should be considered how it appears to the supplier and how it directs the pricing of the services. It may happen that the licenses are a lion's share and what you put into the support service for a monthly price is a rounding error.* (Digital Revolutionist)

When calculating cloud services, there are many and especially smaller operators who do not have the ability to do RPA by themselves and build a heavy platform. HUS buys at minute prices, which seems to be an upcoming trend. Traditionally cloud services are bought on monthly basis, but little by little we go for an hour or minute prices. That is, the service can be purchased on-demand. The actual idea of cloud service is that the service can be scaled up or down.

5.2 Case 2: Tax administration

The management of Tax Administration has very strong competence in IT and the idea for using RPA originated from the management. The idea of RPA was first introduced already in 2015 as the organization begun to survey RPA solutions supported by a consultant firm Eera (now Korkia). In 2016 Eera and Tax Administration did a feasibility study. From this study over a hundred use cases where identified for RPA.

Legal Counsel II mentioned that Tax Administration has a lot of manual work and numbers of different systems which can be referred to as "jungles". Additionally, the existence of the type of work the organization calls "conveyer belt" work turned out very suitable for a robot to do. The feasibility study (before the tendering process) reinforced the need for RPA. Three from the processes that were identified in the research with Eeera were selected as proof-of-concept projects.

3 proof-of-concepts and one platform

Tax administration chose dynamic purchasing system as a purchasing method. They set up their DPS in the beginning of the year 2017. At that time, they didn't exactly know about their specific needs i.e. which RPA technology would fit them. The idea was to collect experience from different RPA technologies (platforms) and different suppliers. One goal was to have more knowledge inside the organization about RPA.

When the DPS was established, Tax administration described in the documents what RPA means from their perspective; what are the benefits that are anticipated and where RPA

would be used. According to Legal Counsel II, the attention was given to the goals that the organization had. The fact how automation would specifically done was left out.

In the first tender under the DPS, Tax Administration had three different use cases to test, which each were put out to tender at the same time inside the DPS. Tax administration videotaped the three different processes and the videos were included in the tendering documents. This was done to demonstrate for suppliers what the use cases are and the systems that that are used in the processes. Good feedback was received from the tenderers about the video approach. It was stated in the tendering documents that a supplier could be awarded for only one of the three lots (meaning one proof of concept project). According to the procurement law it is not possible to require a different technology for each lot, but Tax Administration was lucky as they received offers with different technology for each of the use cases. This made possible to gain experiences.

After three proof-of-concepts were in production phase, the Tax administration thought that from the management perspective, it would make more sense to have only one RPA-technology (platform and orchestration tool). The Tax Administration intended to build own know-how around RPA. This also affected the decision to procure one technology. Of course, in the beginning the supplier is involved in automating the workflows, but the idea was that Tax Administration would do that work in the future themselves. This considered, using one technology - the operation one platform - is better. If a supplier does everything, then it could be possible that there are different technologies. If the procuring organization wants to use the orchestration tool by themselves, then it is easier to have only one technology.

The invitation to tender of the platform was published during the spring 2018. At this stage there were no specific use cases described or videoed as the purpose was that processes are automated in the future as seen best. Of course, there were the goals and general use-cases described when establishing the DPS.

Legal Counsel II feels that the number of suppliers inside the DPS was adequate. When the DPS was established, 10 suppliers joined in and later the number rise to around 13. In the first competitive tendering held under the DPS (the proof of concepts), Tax administration received 7 tenders and when the platform was later put out to tender the number of tenders was only 4. According to Legal Counsel II this indicates the difference between the first and second procurement under DPS. The specifications were quite loose in the proof of concept stage as the goal was to experiment above all else and to receive

experiences from different technologies. In contrast, the second tender was executed very carefully and lots of time was put in to the planning. The specifications were more precise.

In the tendering of the proof of concepts, the award criterion was the lowest price.

> *"There was discussion about it [the contract award criteria] - I do not principally like to use the price as the only award criteria. So, I remember trying to say; are you serious that lowest price will win this? To this our inner customer reasoned that we don't' know our needs and we do not know what we can value. For this reason, we can't use quality criteria at this point [for proof of concepts]. I thought this was rather good argument." (Legal Counsel II)*

It shows how important it is to know what the goal is. At first it was receiving experience of different technologies. Tax administration was only committed for the proof of concepts so there were no big risks included. In the second competitive tendering, the weight of the price was only 40 %. The quality was divided so that 10 % weight was given to additional technology features and 50 % on the attributes of the specialist who would provide the service. The minimum specifications for the platform were quite precise, so therefore more weight was given for the quality of the specialists.

Experiences from tendering RPA

Legal Counsel II considered that one of the challenges is that everything necessary is included in the procurement. Secondly, placing the award criteria was one of the challenges. The quality criteria were mainly based on the experience of the specialist that would be involved from the supplier side. It is hard to make quality distinction between different technology solutions that would be in accordance with the procurement law. Criteria that compares different technology are so easily discriminating. Almost all the suppliers received full points from the technical quality (weight 10 %).

Legal Counsel II mentioned that the pricing model was one of the most challenging aspects of planning of the competitive tendering of RPA. It is also the most usual part where you can mess up and then the whole tendering is then ruined.

> *"The price form was done so many times all over again. This took lots of time, but it is something that you should do with care. Afterwards we asked from the supplier, who was awarded the contract, what they thought of it. They said that it was executed well, and they felt that it made the different options comparable"* (Legal Counsel II, 2018)

The license models of the suppliers are very diverse - others charge for the number of robots, others have separate licenses for the orchestration tool and then there are the different environments (learning, development, test and production) that can also need specific licenses or not. Legal Counsel II says that their solution for this problem was to break down the pricing to smaller sections, so a price could be given to each section (licenses for development, production and orchestration tool) and if there was no separate charge for a section then it could be marked as zero.

The pricing of the robots was gradual i.e. split so that a price could be given to first 50 robots and then for the additional robots (one price for additional robots when the number of robots in the production is from 51 to 150 and then another price for additional robot when over 150 robots are in production. Tax administration also asked a price for the implementation project (fixed price), for education and different types of consultative work (price per day) and for support services (price per month). Tax administration explored the license models and considered all elements when designing the pricing model. This enabled that all suppliers inside the DPS could have a chance to tender. Legal Counsel mentioned that the price differences were very substantial, so it really matters how much you weight price in the tendering.

It is important to understand how procurement of RPA differs from other procurement. It is fairly simple technology as processes are automated and different software are connected. Yet, Legal Counsel II feels that it is more complex procurement than other software.

> "*This is not a basic software procurement. It includes the orchestration tool, the different environments and the robots, which number is increasing all the time. A good understanding of the subject matter is needed so that the contract can be written… I don't have ICT background, so I was explained many times on flap board so that I could understand what we are purchasing."* (Legal Counsel II)

Also, the question of immaterial property rights (i.e. who owns the rights for the "robots") must be addressed. A general contract base cannot be used as the RPA procurement has

its own characteristics. Tax administration did not use any other organizations base for contract, all contents were written from start by themselves. This needs close collaboration inside the organization - the procurement unit cannot manage alone.

All things considered the preparation phase is the most critical in the procurement process - whatever the subject is. Legal Counsel II feels that they succeeded in their procurement above all due to allocating enough resources for the preparation. Additional factor that explains success is that they also took learnings from the tendering of proof of concepts. For example, the fact that what should be noticed in pricing model came evident in the first tendering as they didn't ask a price for orchestration tool and in some tenders, it was included in the price and in others not. Tax administration didn't have any need for it for the proof concepts as only single processes was automated, but this was essential to recognize for the tendering of the platform. The price model needs to be explicit and the purchasing unit should acknowledge what is included in the prices.

Basically, Tax administration got through the procurement mostly by themselves. As mentioned, in the beginning a third party, a consultative firm, did the preliminary research. Tax administration has one person with RPA know-how. If a public authority does not have any know-how inside, then it is very hard to start an RPA procurement. In any case RPA requires a plan from the organization. Decisions need to be made - whether own competence is built or not, and whether the automation work (programming) is outsourced from the supplier or not. Same questions are relevant when the subject matter is artificial intelligent. Tax administration has already experimented in AI, but these have been small trials. Legal Counsel II sees that it is not necessarily efficient that all governmental agencies should have their own competence in RPA and AI, but at least competence inside government is needed, possibly a centre of excellence to facilitate training and sharing of knowledge and best practices.

Legal Counsel II sees that if organizations do not have their own competence, then they would need help from outside. The reason that many have their own DPS is that they want to learn and gain knowledge inside their organization. The tax Administration has good competence in tendering, so they didn't need any help in that area. If help for tendering is offered to public sector, one aspect is analysing what is the gained value from arranging a procurement internally versus outsourcing the tendering support. What are the benefits and the workload compared to a situation where organization tenders by themselves? If joint procurement is available, it is always better if customer can purchase straight without further tendering (mini-competitions).

Characteristics of DPS

When speaking of the benefits of DPS for purchasing, Legal Counsel II mentions that the system enables loose description of the subject in the establishment stage. It could be said that when suppliers have the information to evaluate whether they should join the system or not, the degree of precision is adequate. Moreover, there is no requirement that a draft contract should be included at the establishment stage. The DPS is practical as the need arises, the DPS enables that the tenders can be received faster than normally in tendering procedures, although the period to receive tenders should be 3 to 4 weeks when the subject matter is RPA and the purchasing unit wants good tenders. But the potential tenderers are already selected and known in DPS.

Legal Counsel II brought up the developing field of RPA. One benefit of DPS is unquestionably the possibility of new suppliers joining under the DPS during its existence. This also happened in the case of Tax Administration as the number of suppliers grew after the initial set up. All in all, DPS can be described as flexible.

The system is more appropriate when there are numerous repetitive purchases. The full potential of DPS is not necessary reached if only couple of purchases are made during the period of DPS. Still, Legal Counsel II feels that in their case it was alright as they didn't have the information about their needs in the start. They have afterwards analysed if the dynamic purchasing system was the most appropriate method. Looking back now the DPS is not necessary if the purpose is to procure one platform, one orchestration tool etc. Then there is no need for continuing purchases inside the DPS. But for their needs DPS was suitable as they wanted to test fist.

Legal Counsel II sees that DPS should be used tactically. This means that is careful considered where it is used - not in every place. What should also be considered is the value of DPS if it is used by a central procurement unit.

5.4 Case 3: the Finnish Government Shared Services Centre for Finance and HR

Before RPA was considered, Finnish Government Shared Services Centre for Finance and HR (hereinafter referred as "Palkeet") had already used other tools to improve efficiency. One of the tools used is Microsoft Access, a database engine, to check and reconcile small amounts of data. Information was moved from reports to Access to do comparisons. Also, Winshuttle is used to streamline data movements to SAP. In addition to these tools, the philosophy of continuous improvement called Lean was also familiar to Palkeet.

> *"We of course acknowledged that Lean is one option. If processes can be improved, the automation is not necessarily even needed. And it has been proven with the potential RPA use cases - as the processes have been more closely analysed leaning could also lead to results."*

When leaning processes or automation are not applicable, software development is considered as one option. These different options to improve processes are still used in Palkeet even after the introduction of RPA.

Experiences from RPA

As the discussion of RPA emerged around year 2015, Palkeet noticed that they had lots of processes in which RPA could be used to increase the total performance. The estimate was that 20-50 % of manual labour could be minimized with RPA. Palkeet used a consultative firm Eera (now Korkia) in the preparatory phase. The preparatory phase generated valuable information about technology, suppliers, solutions and generally knowledge about RPA as the subject was new to the whole organization. In the end of the preparatory phase a quick survey was executed to find out use cases for RPA. Up to 60 use cases were identified during a half day work shop alone. The identified use cases were categorized according the expected efficiency from automation in order to prioritize them. After this quick survey the use cases have been later reviewed. The preparatory phase included also planning of the vision and the goals of the procurement. One goal was the amount of work time saved in work years before the year 2020.

Palkeet has operated as a process organization from the year 2010, so the main processes had process descriptions. Of course, the main processes contain bunch of smaller process and tasks. For example, the purchase-to-pay process included many use cases for RPA.

The processes or tasks where RPA is used are different from each other, but the tasks listed for RPA were similar in that sense that they included comparing, verifying, reconciling or updating data. And they of course also filled the basic prerequisites for RPA: routine and rules-based tasks, as well as structured data. Of course, all use cases include some exceptions that need to be addressed manually, because the robot cannot figure them out. Even though the RPA vendor of Palkeet offers licenses for front-end task (robot can be installed to a workstation and run according to need), all the robots used now in Palkeet are so called back-end robots that work timed on the background and from the server.

Palkeet made the decision in the beginning of the journey to build RPA knowledge inside the organization. During the RPA project Palkeet had part time workers from their own staff

for learning and programming the robots. This turned out to be challenging as learning these things takes time and you forget things if you are not actively using the skills every day. After the delivery project, the supplier was still helping to automate processes, but simultaneously Palkeet automated some processes by themselves. After the beginning of the year 2018 a development team was set up. Team includes 15 persons and all of them participate in the automation, but not all participate in coding. At this point the supplier is only needed time to time. They do not participate any more to giving instructions to the robots i.e. programming the robots.

The area where most work has been done - and will be done in future - is the choosing of the use cases for RPA. The assessment of effectiveness and efficiency needs to be done in order to decide if it pays off to automate them. The prioritization in this type of organization is needed as there is lots of manual work and lots of tasks that can be automated.

The decision that RPA knowledge is built inside the organization has called for lots of education as staff is trained to new job descriptions. Many of the employees working with RPA have business education background. Only three members of the RPA team had previous knowledge from programming, and the rest have been learning completely new tasks. In addition, the process specialists and owners are needed to describe what needs to be done. Very wide collaboration is essential. The communication needs to be in a central role so that people understand the benefits.

Palkeet has automated during the past couple of years over 100 use cases and there is a continuous que of new tasks to be automated for the RPA team. When discussing the new case, it might come up that something else is better for improving the process or task than automation.

Tendering of RPA

Looking back, Palkeet feels that the tendering process was successful. There were enough suppliers interested in the tendering so that competition could be achieved. And most importantly, they have incorporated RPA in their organization as a result of the tendering process. At the time of the tendering process there was not that much of RPA capabilities in Finland compared to now. The market conditions have clearly changed according to the observations of the Development Manager. However, reflecting on the goals placed in the beginning Palkeet has been satisfied with the supplier that was selected as result of the tendering.

The government central purchasing unit, Hansel Ltd participated in the procurement process to offer support for the tendering. The Development Manager feels that this benefitted them as they had a tendering consultant and a legal counsel from Hansel to help. Palkeet felt that most support they needed in the pricing model, negotiations and building the contract. Palkeet was responsible for compiling the specifications for the procurement.

The developing manager described that these were found very challenging. They had to spend time and resources looking for information. There was nothing readymade that could be exploited. The third party that was used in the preparatory phase did not participate for the specifications.

Before the actual tendering process started Palkeet had discussion with the different vendors of RPA platforms to find out information. Palkeet asked for demonstrations of the tools and descriptions of the features. This type of work had to be done in order to know how to make the specifications for the procurement. This work took approximately two months as this work was done along the normal work of the team involved form Palkeet. Few people participated in this process, others concentrated on the specifications for the technology and others (process specialist and substance specialist) for the describing the tasks for RPA that should be automated during the project delivery. Altogether four were picked to be automated during the project delivery. One of these was dropped from the list as it turned out that it was easier to do with MS Access.

The main reason for choosing negotiated procedure was because of the varying pricing structures of the suppliers. When asked about what would be done differently looking back, the Development Manager said that they would maybe consider using the dynamic purchasing system. This DPS was couple of years ago very marginally used, but now would be a potential option. A supplier could first be tendered to accomplish a proof of concept (PoC). However, the Development Manager considered that there are no other things worth mentioning that would be done differently. Also arranging a hackathon (combined with design contest mentioned in the procurement law) was considered as one option. According to the Development Manager, it would have been interesting to see how a supplier demonstrate the feasibility of a technology.

The Development Manager stressed the importance of a proof of concept or at least a preliminary survey. The purchasing unit should have clear goals what they want to achieve with RPA. Another suggestion from the Development Manager was that, the proof of concepts should be separate from the actual tendering of the technology.

> *We had luck on our side - although we did not have a proof of concept, we still could proceed after procurement, and we have also received good experiences of RPA and can continue using it. There are lots of task identified that can be automated with this tool.*

Today, the tendering would not include so much risks as there is more knowledge about RPA available and more is known how the tools are applied to the systems. However, the same challenge lies still that how to filter which supplier has the capabilities to operate the technologies. There are more suppliers to this date on the market and even though there are lots of good supplier, some have stronger capabilities and experiences.

What matters most is that the certain things need to be discussed and decided before organization can move to the tendering phase. Firstly, the RPA requires lots of collaborations inside the organization and over the different departments. Therefore, organization needs to gather the persons that need to participate in the project: process specialist, technology specialist, the specialist that are connected with the tasks that should be automated and IT department. Secondly, a choice must be made whether RPA is procured as a service from the cloud or installed to the organization's IT environment. Thirdly, it should be decided how much competence around RPA is built inside the organization, not forgetting the information needed in the procurement stage.

The Development Manager sees that the RPA tools offered by the market leaders can automate any tasks that fill the prerequisites for RPA (routine tasks). It does not break to the fact that it does not work with a certain application. More importantly, the use cases need to be described beforehand and the data that is handled it the processes needs to be analysed (fit for RPA). If not, problems related to the content of data may arise quickly when robot starts to process the material.

> "*As it is in any tendering and procurement, it is so important that the specifications are done properly and that the selection criteria are clear … so that the procurement does not halt to the fact that the procurement is in the Market Court. It is possibly the worst what could happen as you cannot proceed in the pace that was planned. In addition, if the specification is not clear, the supplier is anticipated to have difficulties to providing what is expected. This applies to all procurement*" (Development Manager, 2018)

The procurement included an RPA solution with licenses, a delivery project as well as training, support, maintenance and expert services for the solution. As mentioned before

the negotiated procedure (according to 348/2007, procurement law) was used as it was considered that the procurement was complicated. It was not possible to the purchasing authority to create the call for tenders in detail so that open or restricted procedures could be used. The procedure included two rounds of negotiations with the three suppliers that were selected from the request to participate phase.

The final contract award criteria for evaluating tenders included price with a weight of 55 and several quality criteria on top of that. The experience and knowledge of the supplier's RPA specialists received the highest weight from the quality criteria, which was 20. A project plan received a weight of 10 and a usability assessment another 10. Technical requirements that exceeded the compulsory technical requirements received a weight of 5.

The main objective of the usability assessment was to analyse the suitability of the RPA solution for the automation of organization's processes and tasks in existing information systems. Another objective was to verify the supplier's ability to utilize the characteristics of the RPA solution. Palkeet chose two use cases for the usability assessment to be automated.

Support for governmental authorities

After the tendering process of Palkeet, other public authorities have followed with RPA competitive tenders and they have asked help from Palkeet. The Development Manager told that they have shared their material such as the specification-excel with other organizations asking for advice. Palkeet received public funding for their RPA project so they thought that they would spread this work to others. And as it didn't include any confidential material, there was no restrictions sharing it. The Development Manager believed that the interest is expected to rise and sharing information is good idea among the different actors of public sector.

In the tendering phase Palkeet had prepared to offer RPA license and service to its customers. It was not yet planned specifically, but it was a possibility that was described in the tendering materials. There have been smaller customer cases and now a pilot with the State Treasury. The pilot for State Treasury differs from the smaller customer cases where the substance has been related to Finance and HR. State Treasury has described the use cases for the pilot and made a preliminary survey in their organization. The three use cases that were chosen for automation in the pilot phase are now running in the RPA environment of Palkeet.

The Ministry of Finance has guided governmental authorities turn to Palkeet for help. Therefore, they receive enquiries about RPA continuously. The RPA service of Palkeet is not yet productized, so it not yet in the service selection. However, it is still under consideration when the RPA service can be added officially to services. Main reason for this is the resource aspect and Palkeet still has lots own tasks waiting for automation. Yet, Palkeet is prepared that during the year 2019 there would be roughly 6 to 7 customers that could be served depending of the sizes of the projects. For example, the State Treasury is a very large project and Palkeet will be involved with that also in the future.

The Development Manager believes that synergy benefits will arise if support in tendering is available or an RPA solution is already tendered for the public organizations. The tendering procedures are very burdensome and heavy. Rarely the organizations have their own legal counsel to help in the procurement. Therefore, the bar to start a procurement of RPA is high. The Development Manager believes that surely there would be demand for help with RPA procurement. The worst case is that each organization uses the same time to find information and wonder what should be done and how. This is very expensive way to use public funds. One option of course is that, if the organization does not have experience from RPA it would be beneficial fist to procure specialist to help recognize use cases.

Palkeet is currently tendering artificial intelligence. And in future it might be that the work that RPA is now doing will be enhanced with AI.

5.5 Case 4: HUS logistics

In 2016 HUS had couple of smaller Proof-of-Concepts in which the feasibility of RPA was tested from the organization's perspective. After this the preparations for the actual procurement started. This involved compiling specification and making of inquiries to the suppliers. The outcome was a list of desired features. Project Manager interviewed had a role in building the specification. The preparations and the specifications were completed without a help from third party.

Framework agreement of RPA

The management of HUS wanted that different options would be possible in the procurement of RPA: SaaS and different licence-products. The discussion broadened to framework agreement which would enable that a group of other contracting authorities could have the chance to exploit the same agreement. The result was a broad framework

agreement on robotic process automation services that permitted different types of RPA technology solutions. The purpose was that different RPA services would be available to customers in the way they regarded as the best for them. The method of RPA implementation would be specified in the mini-competition under the framework agreement.

HUS carried out the tendering of framework agreement for the other members of purchasing collaboration (other hospital districts and also municipal authorities) or contracting entities involved. The members of the collaboration themselves were to make their own purchasing decisions. The Project Manger did not know the scale that the other members of the collaboration have used the framework agreement to this point. No survey has been conducted about how useful the framework has been.

The specifications of the framework agreement were not planned or built together with the other members of the purchasing collaboration. HUS had done the specifications already and the idea was that others would take advantage of that and save time. Few meetings were held, but the members of the purchasing collaboration didn't have things to add. Basically, the specification that HUS had put together was used. Firstly, the specifications included the operational requirements. The main headings were general requirements, general requirements for RPA, process or task specification, requirements for orchestration tool, requirements for processing data and reporting. Secondly, the non-operational requirements included the following areas: general requirements, usability, support and maintenance, requirement for service period, testing environment, technical requirements, user identification management, requirements for language.

All in all, the preparations took a lot of resources.

> *"The preparation of the framework agreement took approximately one year and the preparing for the mini competition took half a year. So, time was burned."* (Project Manager)

Project Manger hopes that the framework agreement has saved the work time of others as they didn't have to work on the specification. The readymade framework agreement assists them as they can have repeating purchases inside the framework or start building a long-term environment - overlapping work is hopefully reduced. The members of the purchasing collaboration have not shared information afterwards. The Project Manager considered that it would be beneficial if experiences would be exchanged. But this would require work contribution from HUS. At the moment there are no resources for this.

14 suppliers were awarded inside the framework agreement. HUS wanted to ensure that the framework agreement contains many different technologies and RPA delivered as SaaS or on-premises. In this sense the specification could not go to detail and the requirements are quite general. This was considered as challenge in the setting up stage.

Project Manager has heard that others have established dynamic purchasing systems. Project Manager feels that it might be more functional as suppliers can join in and it can answer to developing technology. Project Manager has noted that suppliers have aimed to incorporate artificial intelligent to the same product branch. In this RPA procurement they had only demanded for text identification, but no artificial intelligent as such was required. HUS has acquired artificial intelligent separately. Another notion that has been made is that the suppliers started with one technology and have now moved to having several different in their repertoire. Also, the open source robot framework based on test automation has entered the market. Project Manager feels that because it is developed by a community it might have all the functionalities needed. The other side is that the user interface and technology require more expertise compared to off-the-shelf-products. The specialist who have this expertise are more limited. Project Manger has heard that one of the members of the purchasing collaboration has awarded the contract to a supplier offering an open source solution (robot framework).

Mini-competition under the framework agreement

HUS decided that cloud service or "SaaS" (Software as a Service) would suit their needs the best. In addition, a specialist to build architecture and do the developing was also put out to tender. It was anticipated that there is heavy demand for the automation of processes internally and it certainly looks that there are more needs than can be served from the HUS IT Management. A management model was also needed.

In the framework agreement stage, only a roof price for a work was asked and the price was the only comparison criterion. In the mini-competition the price was based on the usage of the service.

> *"When the SAAS was put out to tender, HUS wanted the price to be based on how much the service is used. The price was minute-based. The minute-based price caused that the suppliers had to calculate how much they charge for having the automation environment running. -- This decision was made because the suppliers had different licensing models."* (Project Manager)

This meant that they did not have to buy their own licenses or servers, manage or update hardware, or worry about scalability. The cost of service is predictable and cost-effective. Even though the license models are different, the suppliers all offer similar services. This is one of the reasons too why HUS ended up comparing prices this way.

Some of suppliers inside the framework agreement didn't leave a tender. The Project Manger believed this was because the risk that the supplier had to bear in pricing according to the use. Of course, there is a risk for HUS as well. But so far everything has gone without problems. For specialist work HUS has asked a price per day.

In the mini-competition stage HUS had quality criteria for the experiences of specialist of the supplier; architecture specialist (for setting up the technology), analyst (going through work flows and processes) and RPA specialist (programming of the processes). The experiences form included experience from equivalent solutions, experience from process development and lean certificate, experiences of RPA etc.

RPA operating model

HUS has now one technology in use and it is the same RPA technology tested in the proof-of-concept stage in 2016. Project Manager feels that there were no restrictions identified that would exclude some of the RPA technology in their case.

HUS made the decision that no centre of excellence would be set up for RPA. The RPA competence is bought from the supplier. One fear that HUS had was that when the demand of RPA rises there is not enough expertise. This fear has not yet realized.

As the demands arise internally in the organization, HUS has a very broad excel sheet for analysing the potential processes for RPA. In other words, the sheet includes the criteria for analysing the business case: potential for savings, minimizing risks and improving quality. If there is a new process or task to be automated the supplier's specialist is used to do the work. In practice the specialist analyses the current workflow and analyses if there are chances for shortcuts before it is automated. The robotics also enables that something is done with fewer steps.

Project Manager mentioned that any organization that is planning an RPA procurement should have the processes listed, so that the needs would be clear. In their case the implementation environment and the driving environment exist with their own agreements and the robots can be programmed separately. This model would make possible to buy work from different suppliers for different processes, but for now they have only one supplier

for both. All things considered, the use for RPA should be so accurately thought to know which type of solution is right. Project Manager adds that it is essential to know what type of environment the RPA is used and what is the operating model.

Project Manager sees that as RPA brings savings and creates efficiencies, it is easy receive funding for these types of procurements and convince the importance. HUS tries to do inner marketing and report what is done and what are the benefits.

5.6 Case 5: Hansel Ltd.

It came up in one interview that there has already been interest towards joint procurement of robotic process automation arising from the customers of governments centralized procurement unit (hereinafter Hansel). In other words, there has been inquiries. As other public organizations have already set up dynamic purchasing systems or otherwise procured RPA, it raises interest towards the subject matter and questions whether central purchasing unit could help. It was considered likely that there will be more enquiries in the future too. So, the interesting question is whether there should be joint procurement in this area or not. In the past Hansel has hardly been involved in this type of joint procurement.

> ''*We haven't had this type [joint procurement] before. Well, we have the eTendering tool [as a framework agreement], in which a specific software has been purchased. But otherwise there are none, so it would be a new territory for us if we would choose to enter the software side. Of course, there has been licenses, Microsoft licenses for example, but otherwise there has not been framework agreement concerning customizable software that would come to mind ''* (Legal Counsel I)

Dynamic Purchasing System of IT consultation

Hansel does not have a specific framework or purchasing system for RPA or intelligent automation. Having said that, Hansel has a new dynamic purchasing system for IT consultant services. The focus is - as the name suggests - in specialist services or works. In other words, subject of the competitive tender held inside the dynamic purchasing system can be specialist resource, -service or a project-based work.

It is said in the DPS documents that: *"Specialists can be utilized among other things to automate manual tasks and processes by means of robotic process automation and artificial intelligence. Specialists can be utilized also in the deployment, finding solutions during use*

phase and giving backup/support for the use of a software". Besides the specialist services, customer can purchase small amounts (max 30 % from the value of the total purchase) of customer specific application, off-the-shelf software or related components. But mainly it is intended for tendering specialist services not the technological solutions.

According to the interviewees, it is possible that RPA specialist work could be tendered from the existing DPS. However, it was viewed that the license products would probably exceed the permitted 30 per cent from the total value. The interviewees hypothesized that there could be perhaps an additional DPS that would cover the software side.

As the DPS also includes specification and IT architecture services (the services can involve planning, evaluations of present state, determining goals, market research etc.) a customer can tender a preliminary survey or specification support under this DPS. This is recommended if help is needed in the first steps of the automation journey. In addition, if the customer wants to use an open source robotic process automation solution, which is without the licensing costs, then it could be possible to tender specialist work from the existing DPS to build an RPA solution (using Robot Framework).

As the dynamic purchasing system is so recent there are not yet experience of RPA related procurement made inside the purchasing system.

Dynamic Purchasing System for RPA

The interviewees agreed that dynamic purchasing system would be best option for automation technologies. Category Manager pointed out the fact that many organizations have used DPS for RPA procurement. This would suggest and support that it is suitable method and could also work utilised in centralized procurement. Legal Counsel I considered that RPA technology can be regarded as common and available from markets, so there is no specific reason why RPA products would not fit as a subject of dynamic purchasing system from the procurement law perspective. Also, the complexity of the technology was not considered that high. The software itself is off-the self and is not expected to require much customization. The question is more about work needed for the training and the use of the technology, rather than work related to tailoring to customer needs.

Category Manger mentioned that some customers of Hansel have asked if a DPS could be set up to for them concerning RPA. And others have already done that by themselves, so this raises questions whether it is sensible from bigger perspective.

"*Now it would be important to analyse is it feasible to have multiple dynamic purchasing systems in the public sector in the same subject matter. Setting up a DPS and running it involves always work. So, if public authorities have their own purchasing systems in place it most likely means that there is overlapping work. If there are separate purchasing systems, creating the best practices for public sector is more challenging. Having a central DPS would also be supplier friendly option as the suppliers do not have to apply and follow different purchasing systems with different way of conduct.*" (Category Manager)

When asked about the benefits of the DPS, it was described that it enables that new suppliers can join the DPS during the contract period as opposed to framework agreement. In other words, the DPS does not lock the supplier pool as in frame work agreement. On the other hand, the number of suppliers can grow quite large in DPS. It requires work from the purchasing unit to go through the applications. In addition, if the supplier sees that there is a smaller chance to get selected it might be that they won't leave a tender.

The interviewees considered that the DPS enables the technological improvement during the contract period. Not only that the new suppliers can entrance the system, but also the suppliers already inside can offer new technologies. That is, the "offering" can develop during the contract period if compared to framework agreement. If a DPS would be set up for RPA it could also include intelligent automation in the subject matter to keep the options open and to avoid a situation where in couple of years, the offering is outdated. The challenge, when planning a procurement for many customers, is that the customer needs are described properly, and the subject matter is right. But as the technology is advancing, the subject matter of the DPS should be broad. All in all, it was seen that the customers could tender the most suitable solution for their needs under a DPS, which is not necessarily possible if a framework agreement is set up.

Another benefit of the DPS is that the period for tendering can be shorter inside the DPS. This helps if customer has something simple and small to purchase, possibly a proof of concept or support in the beginning of the purchasing journey. In addition, the tendering can be executed in shorter time frame as the suppliers are already pre-qualified under the DPS.

The start-up phase is quite light, but the tendering inside the DPS is more work intensive. The supplier expectations for the description of the DPS and how specific the specifications should be, depend from the subject matter. The more terms are locked in the setting up,

the less work is needed later in the tendering phase. The framework agreements typically include more terms and requirements.

The issue of pricing was mentioned in the interviews. The prices are not tendered in advance in DPS, so the price is determined during the mini-competitions held during the timeframe of the DPS. This means that the purchasing authority receives the "best price of the day". This can be considered positive, or it can be also negative. This suggest that there is no real potential for pooling of volumes. But setting a roof prices is possible according to Legal Counsel I, but it is the subject matter of the DPS that dictates whether it is possible to give roof prices. In this case the pricing is quite challenging.

The Category Manager highlighted that the DPS templates can be improved and updated during the existence of the contract period. The customer does not have to start from a blank page. The goal should be that it is easy to go through with the tender using the templates. Also, a described and clear procurement process could be given to customer when they start the planning.

Category Manager thought that Hansel could have a role in creating, gathering and sustaining best practices and learning. And keeping a collaboration network. What also would be valuable that experiences are shared between public sector. As there might be also negative attitudes against knowledge work automation it would be important that experiences are shared openly.

All things considered, it was seen that joint procurement could be possible with RPA, if conducted with the DPS. This would create synergy benefits, but there is not necessarily high potential for realizing economies of scale under the DPS. The Legal Counsel I estimated that the synergy benefits would come from the economies of learning and economies of process. There can be low potential for economies of scale as it is expected that suppliers are interested in joint DPS, but this might not show in the price of individual procurement. The price is only given to one tender at a time, there are no volume benefits in that sense. On the other hand, there would be more competition if the number of suppliers is high.

But it was regarded that there could be the learning perspective and gathering knowledge in one place. There could be great benefits if good templates are made for this specific subject matter in question, and for example for the usability testing. If the templates would be ready and there are instructions, then there would be real interest to use the DPS compared to the open procedure. From the economies of process view, DPS saves time

compared to open procedure as the pre-qualification phase is conducted and the supplier's qualifications are evaluated. The right suppliers are already selected inside. However, the selection criteria for example requirement for supplier's references cannot be constructed from one customers perspective, but in this case, it might not be that relevant. The templates would also save time in the process.

Framework agreements

Framework agreement was not considered suitable for several reasons. It was reminded that the contract period is set to be maximum of four years in framework agreements and after that the subject matter needs to be put out to tender again. It was thought that longer customer-specific contracts are possibly needed when processes are automated with one tool.

> ''*You can't think of automating [a process] for couple of years and then thinking about changing to a new RPA product. The process automation should be with the same product during the time the process itself is in use.* (Legal Counsel I)

However, it was regarded that the contract award criteria would be the actual challenge. So, the question is how to get the right suppliers and the best solutions inside the framework agreement. It is unlikely that there is a supplier with a solution that could perform government wide. Processes and use cases for RPA can be so different between the organizations that it would be challenging to end up with the best price and best solution that would serve all.

> ''*The framework agreement would not be that suitable as that pricing is quite hard to settle. It is hard to say what pricing model could be used to tender the framework agreement and select a supplier.''* (Legal Counsel I)

It was also mentioned that the markets and technology would get locked in the case of framework agreement. It does not allow new suppliers to enter.

Tendering services

Previously Hansel had a consultative role in the RPA procurement of Shared Services (Case 3) in the year 2016. A second consultative RPA tendering project was starting for a customer of Hansel at the time of the interviews for this research (October 2018).

It was considered that if a customer needs help in public procurement generally, then they probably will benefit from the consultative tendering help in their RPA procurements too. However, the needs and specifications relating to subject matter should come from the customer in the tender competitions that are assigned from the customer. On the other hand, if specific type of procurement is repeated, the knowledge builds up and it is easier and more efficient to support the customer.

> *"Every time more experience is acquired from a subject matter, we can have a stronger role in guiding the customer, not just purely navigating the customer through the public tendering process. We can guide the customer by pointing out the most important aspects that are important for the suppliers to know. We still do not have the knowledge or the ability to write the specifications for the customer, but better advices can be given on what should be included."* (Legal Counsel I)

It was also considered that as there is more knowledge about the subject matter it is easier to notice when customer needs help with specifications and know when to advise them to turn to a third party. External consultancy support can be utilized before the tendering phase to receive information about the subject matter or analysing the needs and specifications of an organizations.

Tendering RPA

The Category Manager mentioned that RPA procurement is not just an IT procurement, it involves so much other things that must be thought of. Change management is involved because this technology changes how people work. For this reason, the focus cannot be only on the technology when preparing a procurement.

The interviewees highlighted the importance of careful planning as the most critical stage of the procurement process. It was thought that like in any successful procurement, also in purchasing automation technologies, organization should properly invest time in the planning phase. When time is used in the beginning for careful planning you can save time in the end of the tendering or even at the contract period. If the outcome of the tendering process is a technology that does not serve the needs, then the time and money spent are lost. Category Manager recommended that organization carefully analyses what is expected from the automation. The procurement authority needs to consider what are the goals, analysis of the present state and examination of what is needed to reach the goals.

Organization should have a clear picture of the present state. What software the company has and what third party license terms there are in the organization. The robot substitutes humans in specific routine tasks and carry out them a lot faster. It should be thought how deployment of robots affect existing licenses and the needs of licenses. Legal Counsel I pointed out that organization should find out what is in the markets and what these technologies offer to the organization and its operational environment. What are processes that can be automated. One cannot start tendering without reviewing the processes of the organization and where automation technology can be used.

In the interviews it came up that it would be beneficial to acquire external consultancy support for planning RPA procurement and help to identify potential use cases in the organization or help with the specification.

> *"The people working for government are working on their own substance, so if the organization does not have inner competence in RPA, it could help if consultant work is purchased to help make specifications and bring market insight."* (Category Manager)

> *"The same problem lies here as in other specialist service procurements. You are typically acquiring specialist knowledge from subject that you yourself do not completely understand - otherwise you wouldn't be acquiring it in the first place. Choosing the best specialist is hard as you do not know what is relevant."* (Legal Counsel I)

This type of support could be tendered from the existing DPS before making the actual RPA purchase. The Category Manager reminded that the customer still needs to give effort and strong role in all this, so that they have control over things.

The pricing of the RPA technology was considered a challenge as the pricing models of the suppliers are different. Pricing specialist work on the other hand is easier as it can be euros/ hour. Legal Counsel I mentioned that the negotiated procedure was considered good in the case of Palkeet (Case 3) because of the challenges with the pricing. This was because it was possible to discuss the pricing and other terms with the suppliers. And the suppliers are more committed in the discussion versus an open market survey.

It was mentioned that if the processes are not described properly, it might be that later on organization notices that the technology is not suitable.

> *"It applies to any type of procurement - the more profoundly you can explain the entity what needs to be done and if you can receive a fixed price for that it is much better from the comparison point of view"* (Legal Counsel I)

One challenge that was brought up by the Legal Counsel I was the choice between one technology and purchasing several different. How it is possible to plan selection criteria to select the right supplier and technology when there are differing processes in the organization. In addition, considering the future needs is a challenge compared to a case where you have the specific processes in mind that you can already describe.

The option of usability testing came up in the interview. It can be used to test out the suitability of the offered RPA tool for the organization's processes. This means that the purchasing authority would pick one or more use cases and the supplier would demonstrate how their product would automate the process. This can be used to analyse and verify the usability of a technology. Of course, the other processes in the organizations should be somewhat similar as the use cases in the usability test.

5.7 Summary of the different cases

In the next pages the results are arranged under five categories to compare the cases and summarize the most relevant findings. The first category describes how the RPA journey can be started and how the three forerunner organizations have advanced. The second two categories describe the subject matter of the procurement and what challenges there might be in the tender competition. The last two categories describe what procurement procedures have been tested, what is considered most appropriate method, whether it would be possible to create synergy benefits in this area and how joint procurement could be arranged.

Table 6. Summary of the different cases

	Starting the RPA journey	The RPA as a subject of procurement	What should be considered in tender competition	The procurement methods	Reflection about joint procurement
Case 1 - The view from suppliers and research	• Experimental, advancing with small steps and doing pilot projects. • Potential assessment to evaluate the overall potential for RPA and/or conduct a pilot • Crystalize the vision, goals and needs of the organization → what are the different options to fulfil them? • Scale of RPA dictates what kind of knowledge is needed - doing small pilots of RPA versus large scale implementation of RPA • Very few does everything by themselves and similarly very few outsources everything • Operating model for RPA necessary	• Software market and the service market i.e. reseller market - multiple good suppliers in both • RPA is developing → improved to be smarter and easier to use • It is not advisable to take the basic software procurement templates • Estimating the needed number of robots is hard beforehand • This subject requires reflection and thought • Not much of customization per client, but the robots need to be educated individually • The customers IT policy will dictate wither cloud services or on premise is chosen	• The needs are not fixed and the starting phase takes time → flexibility and scalability are important •Licensing models are quite different from the so-called end-user software •Design call for tenders so that truly comparable prices are received, and all elements are taken in to account. • Run management is a bigger price component than in basic IT procurement → evaluate TCO •Contract period long as the first year goes to learning • Requirements for RPA specialist reasonable as the line of business is young → a good team is more important than finding individual super specialist (do not exist)	• Dynamic purchasing system was considered to be a good → The procurement unit is doing a short list. Facilitates actual bidding but gives some kind of framework. • Artificial intelligence can be included in DPS • The same challenges are present no matter what the procedure is (for example the pricing)	• Saving resources • The small and medium-sized organizations do not necessarily have the business case for RPA by themselves at least with the license products → cloud services are an option
Case 2 - The Finnish Tax Administration	• Consultant firm for a preliminary research → reinforced the feasibility of RPA • Specific needs were not clear in the start → 3 Proof-of-concepts (PoCs) • Goal was to build RPA know-how inside the organization • Realization after PoCs that from the management perspective, it would make more sense to have only one RPA-technology (platform and orchestration tool)	• Not basic software procurement, more complex • Important to know what the goal is • The planning of the procurement took time, allocating enough resources was believed to be a success factor • Learnings from the tendering of proof of concepts • The procurement includes different elements, understanding of the subject matter is needed • If organizations do not have their own competence, then external help is needed	• All the elements are included in the procurement • Pricing model was considered difficult as license models are very diverse • Price differences were very substantial, so it really matters how much you weight price in the tendering • Quality award criteria was based on experience of specialists as it is hard to make quality distinction between different technologies	• Dynamic purchasing system • All in all, DPS can be described as flexible • Enables loose description of the subject in the establishment stage • Enabled 3 PoCs and the tendering of the platform • The number of suppliers grew from the set-up stage • DPS should be used tactically, not in every place • Is more appropriate when there are numerous repetitive purchases	• The gained value from arranging a procurement versus outsourcing if it is not compulsory to use central procurement unit → what the workload and the benefits are compared to a situation where organization tenders by themselves? • If DPS is used in joint procurement, what is the value? • If organizations do not have their own competence, then they would need help from outside • Not necessarily efficient that all governmental agencies should built their own competence in RPA and AI, but at least competence inside government is needed, possibly a center of excellence to facilitate training and sharing of knowledge and best practices.
Case 3 - The Finnish Government Shared Services Centre for Finance and HR, Palkeet	• Consultant firm for the preparatory phase → information about technology, suppliers, solutions and generally knowledge. Plus a quick survey about the use cases for RPA • Decision in the beginning of the journey to build RPA knowledge inside the organization. • Tendering support from Hansel • Setting up a development team • Called for lots of education as staff was trained	• RPA requires lots of collaborations inside the organization and over the different departments • Today more knowledge about RPA and the tools → procurement does not include so much risks any more • Importance of a proof of concept or at least a preliminary survey	• Work needs to be done in order to know how to make the specifications for the procurement • Important that the specifications are done properly. This was a challenge and took time • Most support from Hansel was needed in pricing model, negotiations and building the contract.	• Negotiated procedure because the procurement was seen complicated and differences in pricing structures • If repeated now, using the dynamic purchasing system would be a strong option • Hackathon was considered as one interesting option to see how suppliers demonstrate the feasibility of the technology	• Other public authorities have bee asking for help → continuous enquiries • RPA service for other government authorities in the pilot phase, but not yet productized •Support in tendering available or already tendered → synergy benefits •Worst case: every organizations uses the same time to find information from separate locations and wonder what should be done and how

	Starting the RPA journey	*The RPA as a subject of procurement*	*What should be considered in tender competition*	*The procurement methods*	*Reflection about joint procurement*
Case 4 - The Hospital District of Helsinki and Uusimaa, HUS	• Couple of smaller PoCs in which the feasibility of RPA was tested from the organization's perspective • Decision that no centre of excellence would be set up for RPA in the organization • Preparations for procurement started → discussion broadened to framework agreement • HUS has an excel sheet for analyzing processes and task for RPA → analysing the business case: potential for savings, minimizing risks and improving quality	• Technology and competence bought from the supplier • HUS did not have to purchase licenses or servers, manage or update hardware, or worry about scalability. • Cloud service was analysed to suit the needs best • Price based on how much the service is used, price is minute-based → scalability and cost of the service is now predictable and cost-effective • It is essential to know what type of environment the RPA is used and what is the operating model • no restrictions identified that would exclude some of the RPA technology in their case	• It takes time to prepare and build the specifications • The suppliers had different pricing models, but offer similar services → this was solved by asking the minute-based price → might be a risk for suppliers, but also for the contracting authority • In the mini-competition stage HUS had quality award criteria was based on the experiences of the supplier's specialists	• A framework agreement of multiple suppliers • Enabled that other contracting authorities could have the chance to exploit the same agreement. • Different options were left open such as the technology and how RPA is delivered, SaaS or on-premise → specification could not go to detail and the requirements were quite general. • DPS might be more functional as suppliers can join in and it can answer to changing technology	• Hopefully the framework agreement saves the work time of others as HUS made the specifications • The scale of contracts inside the framework agreement is not known • No survey has been conducted about how useful the framework
Case 5 - Hansel Ltd	• Recommended that organization carefully analyses what is expected from the automation • Analyse what is the operational environment and what are the processes that can be automated • If organization does not have knowledge inside → acquire specialist support from third party to help to identify the RPA potential and design the specifications • Organization still needs to have a strong role and control when preparing the procurement	• Not ''just another IT procurement'' as it involves other things that need to be addressed when preparing the procurement • RPA technology can be regarded as ''common and available from the markets'' these days • Expected that more work is included in the training and using RPA than tailoring the software to customers needs	• The pricing models of the suppliers are different. Pricing specialist work on the other hand is easier as it can be euros/ hour. • Choosing the best specialists might be hard as it not clear what is relevant • In any type of procurement : The more profoundly you can explain the entity you need help with the better. And if you can get a fixed price for that it is better from the comparison point of view. • Possibility of usability testing	• DPS would be appropriate for this type of procurement • Yet if public authorities have their own DPS in place it most likely means that there is overlapping work •Permits longer contract period than framework agreement. •More open and flexible → does not lock the supplier pool • Start phase is quite light, but tendering inside the DPS is work intensive → good document templates are necessary •Framework agreement is more challenging: hard to design a pricing model that would be used to tender the framework agreement and select the supplier/suppliers	• Synergy benefits would generate more from economies of learning and economies of process • Overlapping work should be minimized • Joint procurement could be possible with RPA, if conducted with the DPS • The DPS: customers tenders the appropriate solution suited for their needs • Framework agreement: how to select the right suppliers and best solutions into framework agreement? At least it is hard to select a supplier that would excel government wide. The needs are anticipated to be different between the customers • Taking advantage of the current DPS of IT consultation (RPA potential analysis and specifications) • Typically this type of software procurement has not been a subject for joint procurement in Hansel

6. DISCUSSION AND CONCLUSIONS

Motivation for this research came from finding out how the public sector could purchase automation technologies avoiding pitfalls and saving the resources. As the tendering phase is resource intensive and RPA and intelligent automation are recent tools, there is a concern that many organizations are doing overlapping work or having challenges when starting their knowledge work automation journeys from scratch. Therefore, the goal was to find out whether it is possible to create synergy benefits in purchasing regarding knowledge work automation technologies and more importantly how these benefits could be achieved.

In this chapter the findings will be discussed as relative to the literature review. More importantly, the purpose of this discussion is to answer the research questions set in the beginning. The following questions were presented:

Main research questions

- *How synergy benefits could be reached in public procurement regarding purchasing of RPA and intelligent automation?*

Sub research questions

- *RPA and intelligent automation technologies as a subject of procurement and how these fit as a subject of centralized purchasing in public sector?*

- *What should be considered when tendering RPA and intelligent automation?*

- *How to support public authorities in the purchasing process (from need recognition to bidding and procurement) of automation technologies?*

The research and its results focus more on RPA than other knowledge work technologies as the forerunner organizations had experiences from RPA. Yet, intelligent (process) automation and artificial intelligence were approached, mainly to understand the differences and how RPA will develop in the future. The results indicated that RPA and AI answer to very different needs. The problem that RPA tries to solve is much more limited compered to AI, which is more multidimensional and broader subject. Intelligent (process) automation can be seen as new functionalities integrated to the basic RPA platform. According to the literature (e.g Lacity & Willcocks 2016b; Karamouzis 2016; Tornbohm & Dunie 2017) it seems that there is consensus about the definition of RPA. The market for intelligent automation is still emerging compared to RPA (Lowes et al. 2017), which might explain why

there is not much literature on the subject or clear definition what is meant by it. Even though RPA is in the spotlight here, it is anticipated that the observations of this research might assist with more intelligent automation technologies too.

6.1 Automation technologies as a subject of procurement and fit for centralized purchasing

Both empirical findings and literature (e.g. Tornbohm & Dunie 2017) indicate that there are some key questions related to RPA as a subject of a procurement that organizations should present to themselves in the planning phase:

> I. **What is the vision and what are the goals related to RPA?** Is it just a trial or something that is systematically introduced company-wide? Remember that the technology to improve processes does not have to be RPA. It can be any technology and sometimes leaning or streamlining the process can generate a better solution.

> II. **What is the degree of automation knowledge inside the organization before the procurement and after?** How much external help is needed before the procurement? What is the level of RPA knowledge built inside the organisation? Who will "give instructions" to the robots - someone from the organization or the service provider? If you really want to benefit from RPA, you will need internal or external RPA specialists. Even if an RPA tool is claimed easy to use without profound IT skills, organization still needs to be clear about governance, best practices in scripting, and where and how IT is involved. And RPA team is most likely needed inside the organization.

> III. **What are the processes like?** What are the processes or tasks that can be automated with RPA? Conducting an RPA potential assessment is recommended.

> IV. **How RPA will be primarily used?** Does the organization need robots operating on a person's workstation versus unattended robots deploying on virtual machines (back-end vs. front-end)?

V. **What are the requirements from the organization's IT environment and architecture i.e. IT policy?**

VII. **Commercial RPA platforms or open source solution?** The needs of the organization will determine which is the best option.

VIII. **Cloud Services versus On-premise?** Both options have been seen in the public sector. Cloud services are quite transparent in cost terms and a more scalable solution - the service can be adjusted up or down. Robots can be purchased one at a time and even at a minute price. On-premise RPA solutions are used especially by organizations with high security needs. However, high security can be ensured also through private or dedicated cloud.

IX. **The degree of intelligence needed?** Fundamentally, RPA and AI answer to different needs. The basic RPA tool does not have intelligence, it can only process structured data, performing rule-based tasks. However, the RPA technologies are likely to be improved to be smarter and easier to use. If intelligent (process) automation is procured, it should be explained what is required on top of the RPA - what it means from organizations point of view.

The findings indicate that allocating enough resources for the preparation will pay of later. This seems to be a golden ticket to successful procurement - no matter what the subject is. The RPA procurement took considerable time and resources from the forerunner organizations. The situation is different for organizations starting now as there is more information and experiences available, but it does not diminish the fact that subject matter needs to be understood before starting. It is not only a question of understanding the technology, but the findings indicate that it is also important that organizations have a good grasp on what their processes are - how they are documented and understood. If this is done, there is more likely a better understanding what is needed. RPA was described also as a change program which must begin before the actual implementation of RPA in a company (Kääriäinen 2018).

The fit of RPA as a subject of centralized purchasing turned out to be a challenging question. RPA is not a typical subject for centralized purchasing. One interviewee mentioned that typically this type of software procurement has not been a subject of government's central purchasing unit for joint purchasing. As it was mentioned in the literature review, certain

purchase categories are more suitable for centralization than others, for example routine and leverage items. Karjalainen (2011) saw that the ability to standardize is a prerequisite for centralized contracts.

According to the findings RPA can be regarded as common (technology is proven and "off-the-self") and available in the markets (multiple suppliers) and it does not require much customization per client. The technology is used to serve similar needs (saving resources, improving quality, avoiding mistakes). It was brought up in couple of interviews that all main RPA technologies would serve the basic RPA needs. On the other hand, it was considered that the needs of the organizations are very important to analyse before advancing further. Additionally, it was mentioned in one interview that it would be hard to choose the best supplier and the best solution as the needs of public organizations are expected to be different. Bundling the different needs could be a challenge. Also, it came up that smaller organization do no necessary have the business case for the license products as they are rather costly compared to the results. All in all, it seems that the specific needs might rise more from the IT policies of the organization, the different processes and what is the scale that RPA is implemented and what is the level of outsourcing to a service provider.

In the context of public procurement, centralized procurement can refer to central procurement unit setting up of framework agreements or dynamic purchasing systems (DPS) (Pekkala et al. 2017). Framework agreements were not considered suitable for several reasons. Firstly, the contract period is limited to four years, contract award criteria is challenging (how to get the right suppliers and the best solutions inside the framework agreement), pricing and markets and technology would get locked. HUS set up a framework agreement, but the requirements were left very loose. This was done to ensure that different RPA services would be available to the members of the purchasing collaboration in the way they regarded as best for them. No survey has been conducted about the benefits and volumes of the framework agreement. For HUS the procurement was successful.

Nearly every interviewee mentioned DPS as a good approach when subject matter is RPA. However, there seems to be difference if DPS is set up by single organization versus by a central purchasing unit. In Tax Administrations case they needed the DPS for proof-of-concepts (testing of different technologies and finding out the relevant needs of the organization) and the tendering of the actual platform. It was the right path for them, but there were not that many call for tenders inside the DPS in the end. According to literature review a large volume of transactions makes DPS appealing.

It was considered that the number of many different procurement authorities and the difficulty to achieve economies of scale are factors speaking in favour of DPS. Implementation of a DPS at a central purchasing unit level would seem the most suitable solution to minimise duplication of resources (James 2016). If individual purchasing units engage in their own DPS there is most likely overlapping work. From the central purchasing unit's perspective, the DPS has more use as the frequency of tenders under the DPS would be higher compared to individual organizations setting up their own. However, a deeper analysis of the volumes should be first done to figure out how feasible the DPS would be.

6.2 Tendering RPA and intelligent automation

The findings show that robotic process automation cannot be considered as "just another" IT procurement - it is more complex. One reason for this is that RPA includes many different elements: orchestration tool, the different environments and the robots, which number is increasing. Biggest mistake according to the interviews would be that organization copies or utilizes the basic tender competition templates of other IT procurements.

The findings from the interviews gave understanding about the most important features in tendering RPA. In addition, the findings indicate that the following aspects lead to better results when tendering RPA:

>   I. **An experimental start, advancing with small steps and doing pilot projects/proof of concepts** to figure out the needs of the organization and learn about the technology. Also, external help can be exploited if there is not experience inside the organization.

>   II. **Explaining the subject matter in detail** is important starting from what it means from the purchasing organization's perspective, what kind of processes there are in the organization and what are the needs related to RPA. If possible, videos should be made of the key processes that need to be automated. The more profoundly you can explain the need to suppliers, the better tenders you will receive.

>   III. **It is not advisable to use general software contract base**. RPA is fairly simple technology, but still rather complex to put out to tender as it involves many elements; the orchestration tool, the different environments and the

robots, which number is increasing all the time. A good understanding of the subject matter is needed so that the contract can be written.

IV. **Extra attention should be given to pricing** as the pricing structures are very different among the products**.** The call for tenders should be designed so that that truly comparable prices are received, and all elements are taken in to account. The maintenance of the robots or "run management" is a big price component compared to standard ready-made software solution. Therefore, evaluate total cost of ownership (TCO).

V. **Flexibility and scalability are necessary** in a RPA procurement as the first year goes to learning and the automation volumes grow gradually. All cost should not actualise in the beginning in full force, rather there is a model where for example licences can be purchased one at a time. Forecasting of required capacity i.e. number of working robots is challenging in advance.

VI. **Quality award criteria related to RPA technology is challenging to come up** as it is hard to make real distinction between different technologies that serve for same purpose. Quality could be analysed conducting usability testing or by

VII. **Requirements for RPA specialist should be reasonable** as the line of business is quite young. The suppliers do not have single experts who can master everything in robotics and have experience in training and mentoring. Having a good team from the service provider is more important.

VII. Contract period should be long enough as the first year goes to learning and the second year is when things start happening. The follow-up contracts awarded by competitions should take in to account that the automations that are already running are platform-specific. It is not possible to transfer automations done with UiPath to BluePrism.

The different forerunner organizations (Cases 2 -4) used different tendering procedures or methods for tendering RPA. The organizations all had their own reasons for choosing the approach they did. It turned out that all three organizations had successful procurements and they have been pleased during the contract period. This suggests that that there is not necessarily right or wrong procurement procedure as long as it serves the needs and goals

of the organization and is feasible from the procurement law perspective. The novelty of the subject matter could be the reason for the diverse approaches.

The Tax administrations case demonstrates that the DPS worked for them as they did not know their needs in the beginning. The DPS allowed the testing different technologies and learning of the organization. During the journey they made the decision to procure one platform for their use. Palkeet carried out their tender before anyone else, they used negotiated procedure as the information was more limited and it was hard to design the requirements without negotiating with the suppliers. HUS had the broad framework agreement in place to carry out their own RPA procurement and give a chance for group of others to benefit from it at the same time. In conclusion the needs of the purchasing organization(s) and the market circumstances affect the approach.

6.3 Support for public authorities

The findings indicate that the degree of how much RPA competence is build inside the organization varies. For example, Tax Administration and Palkeet had both decided that they wanted high competence to the organization. It was speculated, that it is not necessarily efficient that all governmental agencies should have their own competence in RPA or AI, but at least competence inside government is needed, possibly a centre of excellence to facilitate training and sharing of knowledge and best practices.

All in all, any information sharing can be seen very important between the public authorities. Palkeet and Tax Administration have already shared their experiences and templates to other authorities. This helps other organizations as they start their own RPA journeys. However, it was mentioned in the interviews that preparing the procurement and the competitive tender requires understanding of the subject matter and the needs of the organization. Therefore, if information is shared between public authorities it should be recognized that there is no set of best practice requirements and specifications that would fit all. These should be observed from the needs of the organization, instead of replicating the requirements of others. It was mentioned that even if Tax Administration had very good materials their call for tenders would not fit everyone. It can be too heavy for others.

Palkeet are preparing a service to provide RPA to other organizations from their platform. This service is now in the pilot phase. The number of customers is quite limited that Palkeet can serve as they also have needs inside their organization. The support that central purchasing unit could offer is not necessarily to compete with the service that Palkeet is setting up. Firstly, the customer base of Hansel is growing in the future beyond the

government authorities. Secondly, it is expected that there are organizations that Palkeet does not have resources for all. There are most likely multiple organizations that would like to tender RPA or intelligent automation.

The support the central purchasing unit can give concerning RPA can be divided roughly to two options, joint procurement or tendering consultation and information sharing. Joint procurement could be organized as a framework agreement or dynamic purchasing system. The result was that dynamic purchasing system would be more appropriate as opposed to frame work agreement, which was considered challenging. The admission to the DPS only requires suppliers to demonstrate their suitability, ability, and capability to deliver the type of procurement in the DPS or a lot (James 2016). This part can be centralized, but each procurement under DPS is put out to tender separately.

The value offered from joint procurement was brought up in couple of interviews. Regulation of the State budget, 22a §, 447/2006, requires that governments agencies and departments must use the agreements of central purchasing unit in the categories of commonplace goods and services or commonplace IT device and their software. As automation technologies are not included in this obligation it is very important to analyse what is the extra value generated that makes the customers turn to central purchasing unit. The other option is of course to tender individually with the requirements they consider best. It was estimated that the value in DPS could come from designing templates and instructions and updating them. Of course, this requires resources from the central procurement unit. However, the knowledge would build inside one place.

One option for support are tendering services offered by central purchasing unit. This can be considered appropriate if the volumes are not high enough for DPS. This is valuable for organizations that would otherwise need help with their procurement or those who do not have their own resources to tender. Of course, also in this option the customer needs to have knowledge from the substance and the needs of the organizations. The procurement or tendering cannot be outsourced entirely.

6.4 Synergy benefits

The literature review indicates that there is consensus that purchasing centralization provides synergy benefits (Karjalainen 2011; Faes et al. 2000; Rozemeijer 2000). However, basis for centralization do not always exist. Categories that are not suitable for standardization should be managed with a decentralized operating model where the purchasing process is conducted by individual units (Karjalainen et al. 2011).

The synergy potential for centralized procurement of RPA can be analysed through the different categories presented by Trautmann et al. (2009): economies of scale, economies of information & learning and economies of processes.

Economies of scale

The first dimension under this category was the degree of "*volume aggregation".* Most importantly, this means the extent to which common requirements and harmonized specifications are available across different entities to improve the negotiation position in the supply market (Trautmann et. al 2009).

The volume aggregation would be more evident in the case of frame work agreements. This is because bundling common requirements and creating higher volumes enable quantity discounts (Joyce 2006). High pressure for product adaptation is considered to lower the bundling potential. The possibility "add up" common requirements for RPA technology, so that relevant volume would be reached during the contract period of a framework agreement, remains unclear.

On the other hand, the findings of the research indicate that RPA is a challenging subject for framework agreements and the DPS was considered far more relevant option. This would create synergy benefits, but there is not necessarily high potential for realizing economies of scale under the DPS. Pooling volumes is hard as each purchase is tendered separately - there are no volume benefits. On the other hand, there would be more competition if the number of interested suppliers is high. Roof prices can be an option in the setup phase of the DPS, but it was considered that the subject matter of the DPS dictates whether it is possible. In the case of RPA, the pricing is challenging.

The other dimension under this synergy benefit is the *"relevant supply market"* which refers analysing suppliers' size, logistics capability and capacity to handle big volumes. This would be relevant to analyse if a single-provider framework agreement would be the approach. This question is not relevant in dynamic purchasing system as it allows interested suppliers to join at any time throughout the validity. The contracting authority can have a large open list of potential tenderers in the system.

The economies of scale are expected to be low when central purchasing unit gives consultative support for tendering and purchasing process is entirely conducted by individual units.

Economies of learning and information

The synergy potential for this category can be analysed by examining *"purchase difficulty"* and *"supply risk"*. Information processing theory suggest that when decision-makers face uncertainty they need to reduce it through gathering additional information (Trautmann et al. 2009). The purchasing process is expected to vary according newness of the procurement, how much information is needed and the extent to which alternative product offerings are considered (McQuinston 1989). All forerunner organization highlighted that it took significant resources to prepare the RPA procurements. The category was new, not only to the organizations, but new in public sector and new in the markets. Specific information was sought in order to handle the purchase. It was also described as a challenging subject matter. The purchase difficulty was high for the forerunners. Today more information is available, but it is expected that the subject matter can be considered difficult for the organizations starting the RPA journey.

Companies can face high level of supply risk in situations where the number of suppliers is low, substitution possibilities do not exist, prices are not stable and supply market is lacking transparency (Trautmann et al. 2009). The findings indicate that there are multiple good suppliers in the markets. One fear that HUS had was that when the demand of RPA rises there is not enough expertise. This fear has not yet realized. The prices are not expected to be subject for fluctuations. However, the interviews indicated that there are substantial differences in prices and pricing of suppliers. Supply market can be seen more transparent now as there is more information available. Substitutions for the RPA technology exist, but after a platform has been deployed it might be hard to substitute it for a different RPA technology as the robots are already running. Supply risk is considered low or moderate.

The findings from literature (e.g. Arnold 1999; Karjalainen 2011) and especially the interviews from case 5 suggest that that the knowledge can build up to centralized purchasing units as they are involved in many different types of procurement and deal with highly regulated purchasing process on daily basis. The economies of information and learning are therefore expected in any case.

Economies of process

Karjalainen (2011) stated that economies of process in the context of public procurement could mean reduction of duplicated efforts in several phases of the purchasing process and standardized operating procedure towards the suppliers.

The synergy potential can be analysed through *"transaction volume"* and '*'process complexity"* (Trautmann et al. 2009). The findings suggest that after a possible pilot or pilots, organizations seem to advance for the actual procurement. The transaction volume i.e. frequency of purchasing activities is seen as quite low from one organization. From the management perspective, it would make more sense to have only one RPA technology in use like Vero and Palkeet did or a scalable cloud service used according to needs from one supplier as HUS has. It is not likely that tendering each automation individually would be feasible. In addition, the contract periods were recommended to be long as it takes time to get to a full sped. So, it is not anticipated that the same organizations would make repeating tenders after a possible pilot phase. However, if there are enough customers, the frequency of the procurements under the DPS could be feasible. The estimated total spend is a key factor in order to ensure that the effort involved returns the expected benefits.

The process complexity on the other hand, is expected to score very high. The process complexity refers to the coordination costs along the purchasing process. It is also the level of information that must be processed along the purchase circumstances (Trautmann et al. 2009). In public procurement the process complexity is high so it would create potential for synergy benefits.

A DPS can generate reduction of duplicated efforts in the first stage of DPS i.e. in the admission stage to the system, which requires suppliers to demonstrate their suitability, ability, and capability to deliver the type of procurement in the DPS. The tendering stage can generate reduction of efforts if resources are used to support the purchasing authorities (tendering materials are improved and updated during the existence of the contract period). Standardized operating procedure towards the suppliers would be another benefit.

If only consultative support is offered, the synergy benefits are expected to be relatively low as volume does not create any difference, each customer would be helped from start to finish separately - duplicated efforts are not reduced. Of course, the efficient purchasing process holds benefits. It was considered that every time more experience is acquired from a subject matter, the central purchasing unit can have a stronger role in guiding the customer, not just purely navigating the customer through the public tendering process. It

is possible to point out to the customer the most important aspects that are crucial for the suppliers to know.

Reaching for synergy benefits

The purpose of the centralized purchasing unit is to reduce public expenditure. The aim is to reach lower prices through volume discounts, provide appropriate quality and reduce overlapping work among the government organizations. In addition, the centralized purchasing units can offer tendering services to support organizations in specific and individual purchases that cannot be acquired through joint procurement. Even though there is consensus among researchers that purchasing centralization creates synergy benefits, not all categories are suitable for centralization. And even if the synergy benefits would be high, securing the potential benefit of joint procurement in a manner that outweighs their cost is challenging.

RPA shows a higher potential for realizing economies of information and learning and economies of process. The potential for economies of scale is expected to be low. According to Trautman et al. (2009) a purchasing category that shows a high potential in one or two categories can still make a decisive reason for centralization (Trautman et al. 2009)

The central procurement unit already has a dynamic purchasing system for IT consultation which enables external help for the critical start phase, this already should help the customers in the planning phase. If a public authority does not have any know-how inside, then it is very hard to start an RPA procurement. Additionally, it was considered that if a customer needs help in public procurement generally, then they probably will benefit from the consultative tendering help in their RPA procurements too. Advantage is that stronger purchasing expertise can be given as the knowledge builds inside.

The findings indicate that DPS would be most convenient method for joint procurement if enough interest would be found towards it. DPS could lower the threshold to try out RPA and learn at the same time as in Tax Administrations case. Setting up DPS was considered quite light resource wise, but maintenance of the DPS during the contract period would require more resources from the central purchasing unit. As every procurement needs to be put out to tender inside DPS, resources from the customers are also needed. It can be equal with the work involved in a mini competition of a framework agreement or even exceed it. If this work is almost comparable to accomplishing a competitive tender individually then the value can be seen minimal. To create value for customers, the central procurement unit

should produce and update templates during the existence of the DPS. The goal should be that it is easy for the customer to go through with the process.

The important thing from the central purchasing unit's point of view is to analyse whether the volumes will be high enough for a DPS of RPA - would there be enough interest from the customers so that the DPS would be also attractive for the suppliers? And how much work would be included from the central procurement unit to create enough value - will the DPS pay back against the intended benefits?

6.5 Recommendations and suggestions for future research

As it came up in the limitations of this research the focus was more on robotic process automation as a subject of public procurement and the experiences the forerunner organizations have had. However, it would be valuable to survey in the near future what kind of specific needs entire client base of the central purchasing unit has considering RPA. This would help estimate how feasible a dynamic purchasing system for RPA would be. In addition, it would be interesting to find out how many public organizations are planning or already have made concrete plans to utilize RPA or AI. And vice versa, how many are still struggling to see what the potential benefits are or otherwise have not considered the topic yet - and for what reasons?

Another interesting subject for future research would be to survey purely artificial intelligent (AI) as a subject of public procurement and tendering. This study focused more on RPA and intelligent process automation as the field of AI is more complicated. Even the term artificial intelligence is controversial. AI is a suitcase word that contains a variety of meanings packed inside. AI related research should be carefully considered, and attention should be given to what is meant by the subject.

When discussing RPA and AI, it seems that it is not the matter whether automation can be used or not in an organization but rather a question where to start. An interesting future research subject would be to analyse what are the potential processes or parts of processes in Hansel Ltd that could be improved and the possible ones that should be automated by using RPA and AI. Routine tasks could be given to robots and the specialists would have more time for planning and value creating.

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